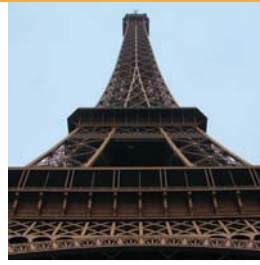
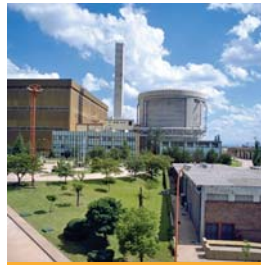
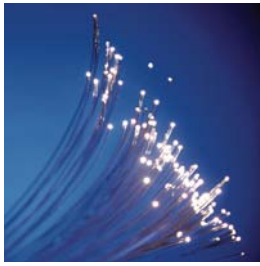


GEOTECHNICAL & STRUCTURAL INSTRUMENTATION

PRODUCT CATALOGUE





At left
 Daniel-Johnson Dam (Canada) | Châteaubriant Donjon (France)
 | Peldar Bridge (Colombia) | Quinshan Nuclear Power Plant (China)

Below
 EXPO02 Piazza Pinocchio (Switzerland) | Monaco Tunnel (France)
 | Etreta Cliff (France) | Koala-Ekati Diamond Mine (Canada)

The Company

The Reference in Civil Engineering Instrumentation

The Civil Engineering section of the Roctest Group, the leading manufacturer of geotechnical and structural monitoring instruments, is in operation since 1947. In 2006, the Group acquired Smartec SA, a Swiss company specializing in the development, production and distribution of measurement and structural health monitoring systems. The Roctest Group is also owner of FISO Technologies, a leading developer and manufacturer of fiber optic sensors and signal conditioners specialized in aerospace, industrial control, energy and health.

The Roctest Group has representation offices in North America, Europe and Asia. The Group's products are distributed in more than 75 countries through a well-established agents network.

The Roctest Group is a publicly-owned company, trading on the Toronto Stock Exchange under RTT.

Products and Services

The Roctest Group products are based on two established technologies: vibrating wire and fiber optics. The products are used in all steps of projects; from the initial planning, construction, operation and rehabilitation. The Roctest Group also offers tailor-made solutions designed for non-standard requirements and specific needs in terms of training, installation and maintenance.

Smartec markets a new generation of products based on fiber optics, laser technologies and other techniques that are especially adapted to civil and geotechnical engineering, automotive, oil & gas industries as well as other demanding applications.



Projects

The Roctest Group products are used in applications such as dams, tunnels, mines, bridges, cliffs, historical monuments, buildings, pipelines, nuclear power plants, offshores and downholes, plane and boat monitoring, and LNG storage facilities.

An Unbroken Tradition of Quality

The Roctest Group has always been committed to providing high-quality service along with the highest level of competence and support.



Above Sichuan Dam (China) | Machu Picchu (Peru) |
 Hazira Storage Facilities (India) | Arsta Bridge (Sweden)



Introducing SHMLive

A web-based, real-time turnkey structural monitoring solution exclusively offered by Roctest and its partners.

The SHMLive solution, offered for a fixed monthly fee, includes:

- 1 The system, designed in cooperation with the infrastructure owner
- 2 The installation, operation and maintenance of the system by Roctest
- 3 Automatic data upload into Roctest's secure online database
- 4 Real-time data presentation and analysis on www.shmlive.com

SHMLive operation

- Roctest engineers design a monitoring strategy in cooperation with the infrastructure owner, and Roctest technicians install sensors at pre-selected locations of the structure. The sensors are connected to data acquisition units (DAUs), which in turn are connected to an aggregation device that oversees the overall management of the instruments and DAUs, and locally collects the data.
- Data is continuously transmitted to the SHMLive secure online database, either through a direct internet connection or through such wireless standards as GSM and satellite.
- The data is analyzed in real-time against limits preset by the infrastructure owner. In the event limits are exceeded, SHMLive automatically alerts the infrastructure owner through such means as SMS, email, or phone calls.
- In addition to an exception-based alert system, SHMLive serves as an archive that enables the infrastructure owner and/or consulting engineering firm to conduct more advanced analysis and to record events relevant to the structure's life.
- Finally, the SHMLive portal can be used to store and share all documents related to the monitoring project, including reports, plans and other useful information.

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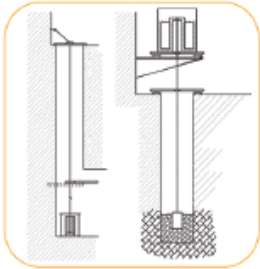
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INCLINOMETERS



PENDULUM *DIRECT & INVERTED*



The **Pendulum DIRECT and INVERTED** is designed to accurately measure the relative internal horizontal displacement of points along a true vertical line. It may be set up for remote readings and automatic data acquisition using a telependulum. Applications include monitoring of movements within dams, dam foundations, nuclear power stations, viaducts and bridge piers.

PENDULUM COMPONENTS

Direct Pendulum	Inverted Pendulum
Stainless steel or invar wire	Stainless steel or invar wire
Upper hook and vee-shaped guide bracket	Anchoring weight
Wire tensioning weight and hook	PVC float and float tank assembly
Damper tank	

INCLINOMETER PROBE *DIS-500*



The **DIS-500** is an inclinometer probe used to locate the depth and measure the lateral displacement and deformation of soil, rock and retaining structures. The probe is waterproof and entirely made of stainless steel. It is also used to determine stability of natural or man-made slopes, embankments, dams as well as deformation of sheet pile and diaphragm walls.

SPECIFICATIONS

Calibration range	$\pm 30^\circ$ (standard) or $\pm 90^\circ$ (optional)
System accuracy	± 2 mm (0.07 in) over 25 m (82 ft)
Resolution	0.01 mm (0.00039 in)
Repeatability	$\pm 0.008\%$ F.S.
Operating temperature	-20°C to $+50^\circ\text{C}$

INCLINOMETER CASING *GEO-LOK*



The **GEO-LOK** is an inclinometer casing used to house inclinometer probes to measure lateral movements and deformation of soil, rock and structures when installed in near vertical boreholes or settlement, or when installed horizontally in boreholes or trenches. It requires no glue, rivets or shear wires to connect adjacent sections of pipe. Easily disassembled and reused in the event of installation problems, eliminating drill rig stand by time and the cost of replacement casing. Telescopic sections are available.

SPECIFICATIONS

Casing OD	70 mm / 85 mm
Casing ID	59 mm / 72 mm
Coupling OD	72 mm / 87 mm
Casing length	1.5 m / 3 m
Spiral groove control	$< 1/3^\circ$ / 3 m

INCLINOMETER CASING *GTI-1A*



The **GTI-1A** is an inclinometer casing used to house inclinometer probes to measure lateral movements and deformation of soil, rock and structures when installed in near vertical boreholes or settlement, or when installed horizontally in boreholes or trenches. Couplings are assembled with solvent cement and rivets. When accuracy is critical, spiral surveys may be performed on deep installations.

SPECIFICATIONS

Casing OD	60 mm
Casing ID	48.5 mm
Coupling OD	68 mm
Casing length	3 m
Spiral groove control	$< 1/3^\circ$ / 3 m



Arche de la Défense (France) | Ait Hammou Dam (Morocco) | Doel Nuclear Power Plant (Belgium) | Laviolette Bridge (Canada) | Cheung Ching Tunnel (Hong Kong) | Taejon Storage Facilities (Korea) | Doyon Mine (Canada)

INCLINOMETER CASING *ICA-2000*



The **ICA-2000** is an inclinometer casing with four orthogonal grooves, designed to be used with all commercially available inclinometer probes to measure lateral movement and deformation. The casing is designed with machined keyway ends on each coupling. Couplings are assembled with solvent cement and rivets. The rivet holes are predrilled to ensure correct alignment of rivets. Lockable steel protective casings are available.

SPECIFICATIONS

Casing OD	70 mm / 85 mm
Casing ID	59 mm / 72 mm
Casing length	1.5 m / 3 m
Spiral groove control	<1/3° / 3 m

IN-PLACE INCLINOMETER *IPi*



The **IN-PLACE INCLINOMETER** is used to measure the lateral displacement of soil, rocks and structures to determine the stability of slopes, performance of dams and embankments, deformation of sheet pile and diaphragm walls. Small built, it is used for surveying inclinometer casing installations in hard-to-reach or remote locations.

SPECIFICATIONS

	High Gain	Standard
Angular range	±10°	±30°
Resolution	0.005°	0.01°
Repeatability	0.01°	0.02°
Linearity	0.8% of F.S., typical	4% of F.S., 1% of half span, typical

MuST FIBER OPTIC INCLINOMETER



The **MuST Inclinometer** is designed to monitor small vertical rotations. Depending on the measurement range, it is used in head-up position for small rotation and high resolution or in head-down position for wider measurement ranges. It uses gravity as vertical reference, it is insensitive to temperature, waterproof and immune to EMF and corrosion.

SPECIFICATIONS

Dynamic range	5° (±2.5°) ~87 mrad (±43.5 mrad) full scale configuration head-up 17° (±8.5°) ~297 mrad (±148.5 mrad) full scale configuration head-down
Resolution	6.2" (30 μrad), configuration head-up 21" (100 μrad), configuration head-down

REMOTE READING PENDULUM STATION *RxTx*



The **RxTx** is a remote reading pendulum station used to monitor the relative horizontal and vertical displacements between a direct or inverted pendulum wire and a structure. It optically measures the relative position of a pendulum wire in x, y, and z axis of displacement in dams, foundations and other structures.

SPECIFICATIONS

Data storage capacity	370 readings on non-volatile RAM
Console	Waterproof
Operating temperature	-10°C to +40°C
Precision	±0.05 mm
Range	50 × 50 × 25 mm

INCLINOMETERS



UNIAXIAL TILTMETER

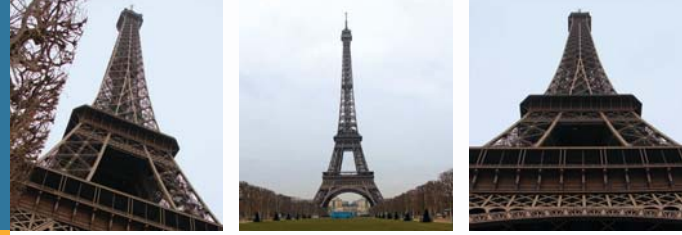


The **UNIAXIAL TILTMETER** is used for a wide variety of monitoring and measurement applications. Housed in a rugged enclosure, it may be used outdoors and in other wet or harsh environments. It is ideal for structural load testing, monitoring of walls and foundation movement, surveillance of natural and man-made structures, and machine positioning and control.

SPECIFICATIONS

Resolution	0.0001° (1.75 μ radian) to 0.01°
Repeatability	0.0002° to 0.02°
Linearity	1% F.S. to <2% F.S.
Operating temperature	-25°C to +70°C

PIEZOMETERS & WATER LEVEL SYSTEMS



STANDPIPE PIEZOMETERS CP1 & CP15



The CP is a standpipe piezometer used to measure pore water pressure and water level in permeable soils within geotechnical applications such as slope stability, dam performance and embankments. It also measures effectiveness of ground improvement techniques, effect of construction on surrounding structures, drawdown due to dewatering and pump tests, as well as seepage through earth structures.

SPECIFICATIONS

Length	150 mm to 600 mm
Diameter	19 mm to 38 mm
Filter	Plastic, ~50 microns, ~10 kPa low air entry

WATER LEVEL INDICATOR CPR



The CPR is a water level indicator used to measure the depth of water in boreholes, standpipes and wells. Light and compact, it offers an accurate and quick readout of water depth. The CPR is available in a large variety of lengths suitable for all needs. It offers an adjustable sensitivity control with an audible and visual signal.

SPECIFICATIONS (of the probe)

Diameter	11 mm
Length	175 mm
Construction	Stainless steel, nylon and brass
Weight	0.110 kg
Tape length	30 m to 150 m

FIBER OPTIC PIEZOMETERS FOP Series



The FOP is a fiber optic piezometer designed to measure pore water or other fluid pressure. It is used to monitor engineering works such as hydraulic structures, foundations, dams, embankments and waste repository sites. It is built with a rugged stainless steel body for harsh environments. Accurate and reliable, it is intrinsically safe and immune to EMI, RFI and lightning.

SPECIFICATIONS

Range¹	200 to 7000 kPa
Accuracy	±0.25% F.S.
Resolution	0.025% F.S.
Outside diameter	19, 25 or 33 mm
Length	122 to 211 mm

¹ Higher pressure range available

PNEUMATIC PIEZOMETERS FPC-2 & FPC-2D



The FPC-2 pneumatic piezometer is designed to measure fluid pressure in soil and at the interfaces or in the vicinity of structures buried in the ground. The design and the materials (brass or stainless steel) used in the construction of FPC-2 make it particularly suitable for use in both short- and long-term monitoring programs where ruggedness, stability and reliability are required. FPC-2 pneumatic piezometers are available with low-air or high-air entry filters. Two models are available: model FPC-2 for borehole installation and model FPC-2D to be pushed into soft soil.

SPECIFICATIONS

Range	0–3500 kPa
Accuracy	±0.25% of pressure gauge scale
Outside diameter	32 mm
Diaphragm volumetric displacement	<0.01 cm ²

PIEZOMETERS & WATER LEVEL SYSTEMS



VIBRATING WIRE PIEZOMETERS *PW Series*



The PW is a vibrating wire piezometer designed to measure pore-water or other fluid pressure. It is used to monitor engineering works such as hydraulic structures, foundations, dams, embankments, excavations, tunnels and waste repository sites. The PW has a rugged stainless steel body with triple stage water protection. It offers reliable surge protection and a high level of resistance to electrical and radio frequency interference.

SPECIFICATIONS

Range	35 to 7000 kPa
Accuracy	±0.1% F.S. to ±0.5% F.S.
Resolution with MB-6T readout	0.025% F.S. (Min)
Outside diameter	19 mm to 38 mm
Length	200 mm to 260 mm

¹ Higher range available

EXTENSOMETERS



RETRIEVABLE BOREHOLE EXTENSOMETER *BOF-EX*



The **BOF-EX** is an incremental borehole extensometer. This design of extensometer is extremely stable and accurate. Unlike rod-type extensometer (MPBX), the 32 mm OD rigid tubing sections eliminate possible bending and friction between rods, and thermal effect is significantly reduced as each measuring module is placed inside the borehole next to the anchor.

SPECIFICATIONS

Standard range¹	5 to 100 mm
Accuracy¹	±0.1% F.S.
Resolution¹	±0.01% F.S.
Operating temperature¹	-40°C to +80°C

¹ Depending on the transducer type

BOREHOLE EXTENSOMETER *BOR-EX*



The **BOR-EX** is a borehole rod extensometer used to transmit all anchor displacements from failure planes in rock or zones of movement in soil masses to a collar reference plate for mechanical readings (dial or depth gauge). To simplify reading or remote monitoring, standard electrical head assemblies are available with potentiometer or vibrating wire transducers. A variety of rod and anchor types are available.

SPECIFICATIONS

Anchors	1 to 6 (in a 76 mm borehole)
Anchor types	Groutable, hydraulic borros, leaf spring anchor
Rod types	6.4 mm OD stainless steel sections (0.5 to 3 m), 9.5 mm OD fiberglass rod

BOREHOLE EXTENSOMETER (displacement sensor) *BOR-EX Head*



The **displacement sensor** used with a borehole extensometer makes it possible to control, with precision, the stability of: foundations, solid masses around tunnels or any other type of cavity, embankments and excavations or natural slopes. The sensor measures relative displacement between the superior free end part of the extension rod reference tip, which is integral to the anchor, and the reference plate or the extensometer head.

SPECIFICATIONS

Range	25 to 150 mm
Accuracy¹	±0.25% F.S.
Resolution¹	±0.02% F.S.
Operating temperature	-20°C to +80°C

¹ Depending on the transducer type

TAPE EXTENSOMETER *CONVEX*



The **CONVEX** tape extensometer is used to measure quickly and accurately changes in distance between two reference points. It is primarily used to monitor convergence in underground excavations such as tunnels. It can also be used to monitor deformations in structures or surface movements.

SPECIFICATIONS

Range	15, 20 or 30 m
Length	550 mm
Repeatability	±0.1 mm
Weight	2 kg

EXTENSOMETERS



FILL EXTENSOMETER *ERI*



The **ERI** is a fill extensometer designed to monitor longitudinal displacements between two points inside any type of man-made fill. It is usually installed horizontally in trenches. It may also be installed vertically to measure settlement at the point of contact with the foundation. It is also used to monitor the crest of earthfill dams to locate tension cracks.

SPECIFICATIONS

Range	50 to 300 mm standard
Accuracy	±0.25% ¹ F.S. (Min)
Base length	3 to 30 m
Operating temperature	-20°C to +80°C

¹ Depending on the transducer type

DISPLACEMENT TRANSDUCER *FOD*



The **FOD** is a fiber optic linear position and displacement transducer used to monitor relative movements of adjacent surfaces across cracks or construction joints in concrete and rock. Working under the Fabry-Perot white light interferometry principle, it is available in either a rugged stainless steel or aluminium housing for harsh environments. Accurate and reliable, it offers high resolution, intrinsic safety and immunity to EMI, RFI and lightning.

SPECIFICATIONS

Range	20 mm (spring-loaded shaft)
Accuracy	±0.1% F.S.
Resolution	±0.002 mm
Operating temperature	-40°C to +80°C

VIBRATING WIRE JOINTMETERS *JM-S & JM-E*



The **JM** is a jointmeter used for monitoring displacements between concrete lifts in concrete dams. Rugged built, it consists of a vibrating wire displacement transducer inside a telescopic stainless steel housing. Easy to install, and extremely stable and reliable, it is also used to monitor separation of shotcrete from a rock face in tunnel walls as well as determining crack and joint movement in structures.

SPECIFICATIONS

Range	25 to 300 mm
Accuracy	±0.25% F.S. (±0.1% optional)
Resolution	0.02% F.S. (Min)
Operating temperature	-20°C to +80°C

PORTABLE JOINTMETERS *PF Series*



The **PF** is a portable jointmeter. It is a practical and affordable instrument used to measure relative displacement of cracks or joints over time. The PF8 is intended for use on delicate structures like masonry, wood or stones. The rugged PF25 is designed to withstand severe field conditions where larger reference points can be drilled, such as concrete or rock surfaces. Fixed or removable reference points are available with both models.

SPECIFICATIONS

	PF8	PF25
Range	25 mm	50 mm
Distance between reference points	200 mm	200–350 mm
Additional extensions (optional)	25 to 100 mm	50 to 200 mm



Arc de Triomphe (France) | Jacques-Cartier Bridge (Canada) | Koeberg Nuclear Power Plant (South Africa) | Saqqarah Pyramid (Egypt) | Vecchio Bridge (Corsica) | Kennecott Mine (USA) | Lepuix-Gy Quarry (France)

MAGNETIC REED SWITCH PROBE EXTENSOMETER *R-4*



The **R-4** is a magnetic extensometer system used to measure settlement or heave in engineered backfill structures (dikes, earthfill dams, road foundations) or in natural slopes or embankments. The system consists of an access pipe or standpipe, anchor magnets and a portable reed switch probe. It may be used with inclinometer casings (70 or 85 mm) to obtain both lateral and vertical movement profiles or with standard PVC access pipe (33 or 48 mm).

SPECIFICATIONS

Tape lengths	30 to 150 m
Graduation	1 mm or 0.1 ft
Probe diameter	16 mm
Anchor types	Datum ring, push-in or leaf spring anchor, and plate anchor

POTENTIOMETER JOINTMETER *REPP-R*



The **REPP-R** is a potentiometer jointmeter transducer for remote monitoring of traction or compression movement such as discontinuities of rock mass or blocks, construction joints in concrete, and expansion joints of steel structures. It has a rugged stainless steel housing. The ball joints allow for a degree of shearing motion. REPP-R is available in three different ranges: 25, 50 and 100 mm with respectively 207.5, 245 and 320 mm base lengths at mid-range.

SPECIFICATIONS

Accuracy	±0.5% F.S.
Resolution (with Palmeto P5 readout)	0.01 mm
Operating temperature	-20°C to +80°C

SURFACE JOINTMETER *RTF 1D & 3D*



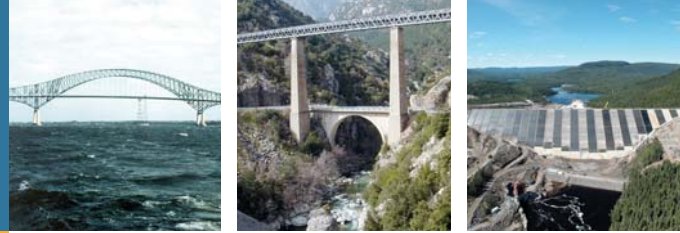
The **RTF** is a jointmeter used to measure displacement of cracks in structures or rock masses. The sensor is housed in a rugged waterproof enclosure which is fitted at one end with a spring-loaded rod resting against the reference surface located on the opposite side of the discontinuity. Supplied with installation template, the RTF is available in uniaxial (RTF 1D) or triaxial (RTF 3D) version.

SPECIFICATIONS

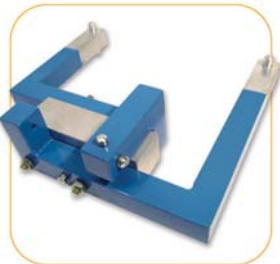
Range¹	5 to 250 mm
Accuracy¹	±0.1% F.S.
Resolution¹	±0.01% F.S.
Operating temperature¹	-40°C to +80°C

¹ Depending on transducer type

EXTENSOMETERS



3-D JOINTMETER VINCHON



The **VINCHON** is a mechanical jointmeter used for direct measurement with a caliper of two adjacent surfaces in three orthogonal directions. This robust instrument is ideal when shear, sliding and tension movements need to be surveyed. Easy to install, the Vinchon requires two drilled holes of 40 mm diameter by 50 mm depth. The legs are grouted in place and readings begin when the initial set occurs.

SPECIFICATIONS

Caliper accuracy	±0.02 mm (digital) or ±0.04 mm (vernier)
Maximum relative displacement (convergence / divergence):	x axis: 50 mm / 40 mm y axis: 30 mm / ∞ z axis: 10 mm / ∞
Dimensions (W × L × D)	210 mm × 180 mm × 60 mm

BOREHOLE EXTENSOMETER WR-FLEX



The **WR-FLEX** is a borehole rod extensometer for monitoring underground openings due to internal stress relief in surrounding rock such as mining or tunnelling applications. It is pre-assembled in our factory and shipped ready for installation. The WR-FLEX has 6 anchor points and an integrated electronic head which can completely be recessed in a 50 mm borehole allowing multiple WR-FLEX to be installed in the same long borehole.

SPECIFICATIONS

Anchor	Ribbed 6 points only
Maximum length	50 m
Diameter	33 mm
Weight	0.5 kg/m
Electrical head assembly:	
Transducer type	Potentiometer
Standard range¹	63.5, 127, 190.5, 508 mm
Accuracy	±2% F.S.
Resolution	±0.2% F.S. (1/100V)

¹ Potentiometer transducer only

NOTE: For mechanical reading maximum length 30 m 5 points only



ANCHOR LOAD CELL *ANCLO*



The **ANCLO** is an anchor load cell used to measure tensile loads in tieback anchors, rock bolts, or compressive loads in structures. It is designed to meet the demands of adverse and severe environmental conditions associated with construction or mining activities such as monitoring rock bolts used in mines and slope stabilization.

SPECIFICATIONS

Load range¹	50 to 5000 kN
Accuracy	±0.5% F.S.
Operating temperature	-40°C to +75°C
Option	Submersible model

¹ Higher range available for solid cells

HYDRAULIC LOAD CELL *HYDLO*



The **HYDLO** is a hydraulic load cell designed for direct measurement of loads in tieback anchors, rock bolts or compressive loads in structures. It is made of two plates welded together around the periphery and filled with de-aired oil. This design is also applied to monitoring rock bolts used in mines and slope stabilization.

SPECIFICATIONS

Load range	250 to 2000 kN
Accuracy	±1% F.S.
Thermal drift	0.1% F.S. / °C
Operating temperature	-20°C to +60°C

TOTAL PRESSURE CELL *TPC*



The **TPC** is a total pressure cell used to determine the magnitude and axis of stresses within a large mass such as concrete dams to measure contact pressure in the foundation and abutments. Made of rugged stainless steel construction for harsh environments, it may be used in embankment dams to determine magnitude and direction of stresses.

SPECIFICATIONS

Pressure range¹	0–20 000 kPa
Accuracy¹	±0.5% F.S.
Resolution¹	0.01% F.S.
Overload¹	1.5 × F.S.

¹ Depending on transducer type

VIBRATING WIRE LOAD CELL *VH*



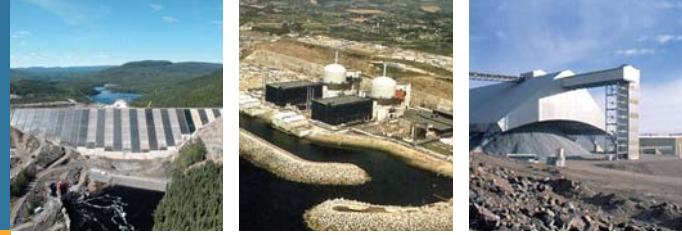
The **VH** is a vibrating wire load cell used to measure loads in tiebacks, foundation anchors, rock bolts and tunnel supports. It is designed to meet the demands of adverse and severe environmental conditions associated with construction or mining activities such as monitoring rock bolts used in mines and slope stabilization.

SPECIFICATIONS

Load range¹	500 to 10 000 kN
Accuracy	±0.5% F.S.
Operating temperature	-40°C to +80°C
Option	Submersible model

¹ Higher range available for hollow cells

STRAIN GAUGES



DiTeSt DISTRIBUTED TEMPERATURE & STRAIN MONITORING SYSTEM



The **DiTeSt** is a unique tool for the evaluation of distributed strain and/or temperature over several tens of kilometers, allowing the measurement of thousand of locations in just one shot by means of one single optical fiber. The DiTeSt System is based on distributed Brillouin Scattering in optical fibers. This system provides high spatial resolution (1 m) and is ideal for strain, leakage, overheat and fire detection.

SPECIFICATIONS

Measurement range	Up to 30 km 150 km using range extenders
Optical fiber type	Single mode
Spatial resolution (depending on type and installation of cable)	1 m over 10 km 2 m over 30 km
Strain measurement range	Up to 2.5% (depending on the cable)
Strain resolution / accuracy	2 $\mu\epsilon$ / 20 $\mu\epsilon$
Temperature measurement range	-220°C to +500°C (depending on cable)
Temperature resolution / accuracy	0.1°C / 1°C
Acquisition time	10 seconds to 5 min (2 minutes typical)
Number of channels	2 standard Up to 200 upon request

DiTeSt DiTemp TEMPERATURE SENSING CABLES



The **DiTeSt DiTemp Temperature Sensing Cables** are designed to monitor temperature over long distances. Up to four optical fibers are contained in a stainless steel loose tube protected either with a wire armouring or polymer sheath. It is used in a wide range of applications that require distributed temperature sensing, such as temperature monitoring of concrete in massive structures, waste disposal sites, on-shore, offshore and down-hole sites in oil and gas industry, hot spots, cold spots and leakage detection of flow lines and reservoirs, fire detection in tunnels.

SPECIFICATIONS

Dimensions	2.2 mm to 5.5 mm
Components	Single mode or multimode optical fibers, stainless steel loose tube and stainless steel armouring
Temperature ranges for sensing cables	-55°C to +85°C (standard temperature version) -65°C to +300°C in long-term (high-temperature version)
Max number of optical fibers	4

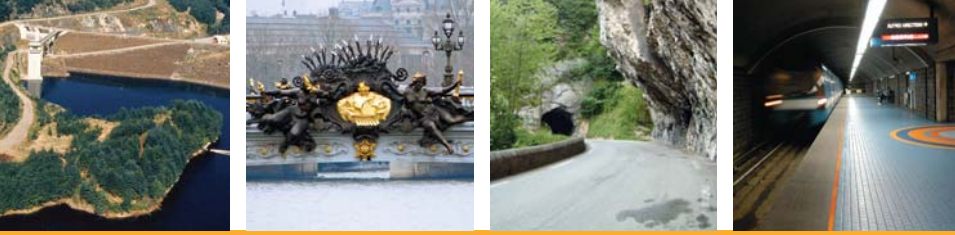
DiTeSt SMARTape SENSOR CABLE



The **DiTeSt SMARTape** deformation sensors are designed to monitor distributed deformation (average strain) over long distances. The tape consists of a single mode optical fiber embedded in a thin fiber-reinforced thermoplastic. It can be glued to the structure, but can also be embedded or clamped. Its high mechanical, chemical and temperature resistance makes it ideally suited for harsh environments like oil & gas, or civil engineering applications.

SPECIFICATIONS

Dimensions	~0.2 mm x ~13 mm
Maximal length	400 m
Strain range	-1.5% to +1.5%
Strain resolution / accuracy	2 $\mu\epsilon$ / 20 $\mu\epsilon$
Temperature compensation	Not compensated



Toulnoustouc Dam (Canada) | Flammanville Nuclear Power Plant (France) | Collahuasi Mine (Chile) | Howard Hanson Dam (USA) | Alexandre III Bridge (France) | Cliff and tunnel on Route des Grands Goulets (France) | Montreal Subway System (Canada)

DiTeSt SMARTprofile SENSING CABLE



The **DiTeSt SMARTprofile** combines strain and temperature sensors that are designed to monitor distributed deformation (average strain) and temperature over long distances. The profile consists of two in the profile bonded fibers and two free single mode optical fibers embedded in a polyethylene thermoplastic profile. It can be fused, glued or clamped to the structure. The profile is designed to monitor distributed deformation (average strain) and temperature over long distances. Its good mechanical, chemical and temperature resistance make it suitable for harsh environments like oil & gas, or civil engineering applications.

SPECIFICATIONS

Dimensions	~0.3 mm × ~8 mm
Strain monitoring fibers	2
Temperature monitoring fibers	2
Maximal length	Approx. 3 km
Strain range	-1.5% to +1.5%
Strain resolution / accuracy	2 με / 20 με
Temperature range	-40°C to +60°C operating, long-term
Temperature compensation	Compensated through temperature sensing fibers (strain <0.5%)

EMBEDDED STRAIN GAUGE *EFO*



The **EFO** is a fiber optic strain gauge designed to be embedded in concrete. It may be cast directly into wet mixture or encapsulated into a concrete briquette to be cast into a wet mixture. Intrinsically safe, it is immune to EMI, RFI and lightning. It allows static/dynamic measurement and can deliver signal transmitted over long distances with no interference due to fiber bending.

SPECIFICATIONS

Range	±1000 to ±3000 με
Resolution	0.01% F.S.
Transverse sensitivity	<0.1% F.S.
Operating temperature	-40°C to +55°C

EMBEDDED STRAIN GAUGES *EM Series*



The **EMs** are series of concrete embedment vibrating wire strain gauges. They can be directly embedded in concrete structures such as dams, piles, foundations and bridges. Three models are available: the standard model (EM-5), one that is designed for use in mass concrete (EM-10), and a miniature model for laboratory use (EM-2).

SPECIFICATIONS

Range	3000 με
Resolution	EM-5: 1 με (Min) EM-2 & EM-10: 0.4 με
Operating temperature	20°C to +80°C
Active gauge length	50 mm (EM-2) 168 mm (EM-5) 254 mm (EM-10)

STRAIN GAUGES



STRAIN GAUGE *FOS*



The **FOS** is a fiber optic strain gauge used to measure the expansion and contraction of materials due to mechanical stress or thermal effect in nuclear power plants, building monitoring and several civil engineering applications. Intrinsicly safe, it is immune to EMI, RFI and lightning. It allows static/dynamic measurement and can deliver signal transmitted over long distances with no interference due to fiber bending.

SPECIFICATIONS

Range	±1000 to ±5000 $\mu\epsilon$
Resolution	0.01% F.S.
Transverse sensitivity	<0.1% F.S.
Operating temperature	-40°C to +250°C

FIBER OPTIC STRAIN GAUGE ENCAPSULATED IN COMPOSITE MATERIAL *FOS-B*



The **FOS-B** is a fiber optic strain gauge used for measuring strain and stress in composite materials which are found in different applications like rebars, prestressing tendons and concrete structure rehabilitation systems. It may be encapsulated in a variety of composite materials such as glass, carbon or Kevlar. Intrinsicly safe, it is immune to EMI, RFI and lightning.

SPECIFICATIONS

Range	±1000 to ±5000 $\mu\epsilon$
Resolution	0.01% F.S.
Transverse sensitivity	<0.1% F.S.
Operating temperature	-40°C to +250°C

INSTRUMENTED REBAR *IRHP*



The **INSTRUMENTED REBAR** is a hollow reinforcing bar containing a coaxially mounted vibrating wire strain gauge. It is used for measuring strain and load in concrete structures such as dams, foundations, piles and tunnel linings. It can be used as sister bars, incorporated into a rebar reinforcement system, or grouted into a borehole for ground support.

SPECIFICATIONS

Range¹	Up to 360 kN
Accuracy	±1.0% F.S.
Resolution	0.1 $\mu\epsilon$
Operating temperature	-20°C to +80°C
Nominal rebar length	1 m (standard)
Nominal diameter	From 13 to 50 mm

¹ Higher range available

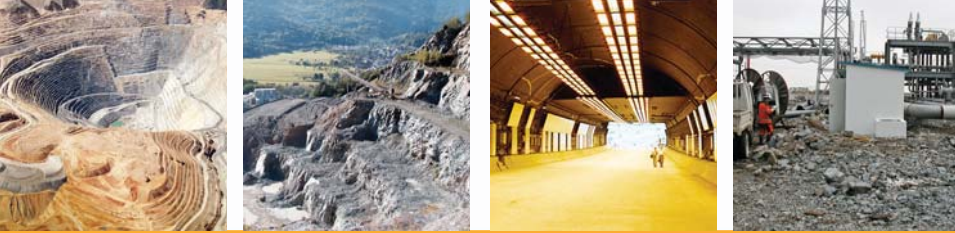
MuST DEFORMATION SENSOR



The **MuST FBG deformation sensors** are transducers that transform a static or dynamic distance variation into a change in reflected wavelength of a prestressed fiber Bragg grating that can be measured with MuST FBG reading units. These long-gauge sensors are surface mountable or embeddable in concrete and permit static/dynamic deformation measurements with or without temperature compensation. Available configurations are single-ended, double ended and chained. They are insensitive to corrosion, immune to EMF and present long lifetime.

SPECIFICATIONS

Length of active zone (measurement basis)	0.25 to 2 m
Pretensioning of the measurement fiber	0.5% length of active zone
Measurement range	0.5% in shortening 0.75% in elongation
Strain resolution / accuracy	0.2 $\mu\epsilon$ / 2 $\mu\epsilon$ (using SMARTEC FBG RU)
Temperature measurement range	-40°C to +80°C
Temperature resolution / accuracy	0.1°C / 0.5°C (using SMARTEC FBG RU)



MINIATURE STRAIN GAUGES *SM-2 Series*



The **SM-2** series of miniature vibrating wire strain gauges is used to measure strain in steel structures where access is limited. The SM-2 is offered in two models: the SM-2W is designed to be spot-welded and the SM-2A is generally installed inside a small diameter borehole.

SPECIFICATIONS

Range	3000 $\mu\epsilon$
Resolution	0.5 $\mu\epsilon$ (Min)
Operating temperature	-20°C to +80°C
SM-2W total length	76 mm

SURFACE MOUNT STRAIN GAUGES *SM-5 Series*



The **SM-5** is a surface mount vibrating wire strain gauge used for monitoring variations in strain, allowing stress evaluation when the material's modulus of elasticity is known. The gauge is mounted on structures such as bridges, piles, tunnels and linings. Two models, differing in their mechanical supports, are available: the SM-5A, which is held tight by set screws, and the SM-5B by hexagonal nuts.

SPECIFICATIONS

Range	3000 $\mu\epsilon$
Resolution	1 $\mu\epsilon$ (Min)
Operating temperature	-20°C to +80°C
Active gauge length	149 mm (SM-5A) 129 mm (SM-5B)

SOFO STANDARD DEFORMATION SENSORS



The **Deformation Sensors** are transducers that transform a distance variation into a change in the path unbalance between two optical fibers that can be measured with the SOFO Reading Unit. The SOFO standard sensor measures deformations with a micrometer resolution. It is embeddable, surface mountable, insensitive to temperature, to corrosion and vibrations, immune to electromagnetic fields and needs no calibration. Designed for long and short-term installations.

SPECIFICATIONS

Length measurement basis	
Standard	0.25 to 10 m
Special length	10 to 20 m
Measurement range	0.5% in shortening 1.0% in elongation
Resolution	2 μm (0.002 mm)

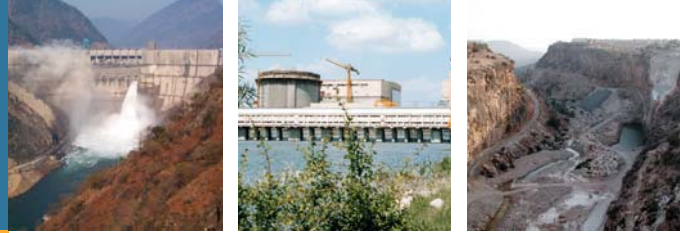
SOFO SMARTape DEFORMATION SENSORS



The **SMARTape Deformation Sensors** are transducers that transform a strain variation into a change in the path unbalance between two optical fibers that are measured with the SOFO reading unit. Its extremely small cross-section and high bending flexibility make it ideal for applications where the sensor dimension or the shape are critical. The SMARTape deformation sensor is embeddable between composite layers, surface mountable, insensitive to temperature variations, insensitive to corrosion and vibrations, immune to electromagnetic fields and needs no calibration. The tape is applicable to traditional construction materials and is designed for long-term installations.

SPECIFICATIONS

Sensing tape dimensions	w = 6 mm, t = +/- 0.2 mm
Length of sensing tape	100 mm to 16 m
Measurement range	1.5% in shortening 1.5% in elongation
Resolution / accuracy	2 μm (0.002 mm)



SOFO CONCRETE SETTING SENSOR



The Concrete Setting Sensor is an optical fiber sensor used for measuring the hardening time of concrete. It is used side by side with SOFO standard deformation sensor and their measurements are to be compared.

SPECIFICATIONS

Standard lengths	0.5 m
Time resolution for concrete setting	1 h
External diameter	21 mm
Axial stiffness (EA)	35 MN
Mass	<1.4 kg/m

SETTLEMENT SYSTEMS



SOIL SETTLEMENT GAUGE *SSG*

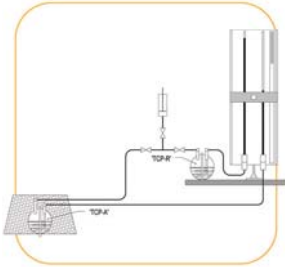


The **SSG** is a soil settlement gauge used to measure settlement or heave at a precise location in soils. The SSG consists of a vibrating wire or fiber optic pressure transducer housed in a corrosion-resistant stainless steel body. Robust and stable, it can be installed in boreholes, standpipes, soil or concrete. The settlement gauge can also be attached to structures for monitoring settlement.

SPECIFICATIONS

Range	5 m to 75 m
Resolution	0.025% F.S. (Min)
Accuracy	±0.5% F.S. (±0.1% F.S. optional)
Thermal drift	0.1% F.S. / °C

CELL SETTLEMENT SYSTEM *TCP*



The **TCP** is a settlement system used for the measurement and control of vertical movements such as construction control or road embankments and earth dams. Accurate and reliable, this system may be used to study the displacement of each layer of soil. The TCP consists of two spherical cells half-filled with an antifreeze solution and connected to a reading panel.

SPECIFICATIONS

Accuracy	±2 mm
Measuring range	1.8 m
Repeatability	Less than 1 mm
Panel material	Aluminium

PACKERS



INFLATABLE PACKERS LP & MP



The **LP & MP** inflatable packers are constructed of one stainless steel shaft with one fixed and one sliding head. The gland is made of reinforced rubber. The unit can be supplied as a single or straddle packer with a central injection zone of 0.5 meter or longer. Different diameters are available and cover a large variety of boreholes in which the packer may be used.

APPLICATIONS INCLUDE

- Pressure grouting in fractured or unconsolidated formations
- Water injection for dust control in coal mines
- Methane gas control and collection in mines
- Permeability testing

INSTRUMENTED PACKER WITH EXTERNAL PIEZOMETER MOD-2A



The **MOD-2A** is a small packer used for measuring pore water pressure at rock/concrete interface in tunnels, underground openings and basements. It is suitable for short-term monitoring of pressure during construction or rehabilitation of underground structures. The MOD-2A consists of a small mechanical packer inserted in a borehole, combined with an external vibrating wire pressure transducer (or a manometer).

FEATURES

- Easy and quick installation
- Retrievable external piezometer
- Possible to measure flow by removing the piezometer



COMPACTION CONTROL DEVICE *BCD*



The **BCD** is designed to measure, in the field and in the lab, a soil modulus at the surface of a compacted layer. This device was developed with the purpose of improving processes of specifying, measuring and controlling soil compaction in earth-works. Two factors motivated the development of the BCD: 1) avoiding nuclear devices, such as the nuclear density gauge; and 2) using a parameter more directly related to limiting deformations, which is the design criterion.

SPECIFICATIONS

Measuring range	Soil moduli from 5 MPa to 150 MPa
Depth of measurements	240 mm @ E of 10 MPa 150 mm @ E of 100 MPa 121 mm @ E of 300 MPa
Time required for a test	Approx. 5 sec.
Datalogger	1 MB RAM with LCD and six function keys to navigate within interactive menus

BOREHOLE DILATOMETER *DMP-95*



The **DMP-95** is used for measurement of in-situ stress-strain properties of rock. It consists of a probe with an aluminium alloy central body. A sediment collector placed on top of the probe is equipped with a threaded end. The probe is fitted with displacement sensors, allowing anisotropic measurements. The DMP-95 comes with its own datalogger. Use at great depth is possible.

SPECIFICATIONS

Maximum working pressure	20 000 kPa
Probe type	Diametric measurement, mono-cellular (displacement sensors fitted)
Probe diameter	95 mm
Probe weight	45 kg approx.
Moduli range	100 to 50 000 MPa approx.
Loading	Pneumatic

FALL CONE APPARATUS *G-200*



The **G-200** is a fall cone apparatus used to provide a quick and accurate method for determining the undrained shear strength and the sensitivity of both undisturbed and remoulded clays. This system is portable, fast, accurate and easy to use. It is also used to determine the liquid limits (fineness number).

SPECIFICATIONS

Undrained shear strength range	0.06 to 250 kPa
Weight with basic accessories	6 kg



PRESSUREMETER *G-AM II*



The **G-AM II** is a Menard pressuremeter used for measurement of in-situ strength and stress-strain properties of soils, soft rock and permafrost. It is an efficient instrument for the evaluation of many ground engineering problems. It features built-in high pressure conversion facilities and direct readout of guard cell pressure.

SPECIFICATIONS

Maximum working pressure	10 000 kPa
Probe type	Volumetric measurement, tri-cellular
Probe diameter	44 mm, 60 mm, 74 mm
Probe weight	4.3 to 6.4 kg
Moduli range	1 to 5000 MPa approx.
Loading	Pneumatic

FIELD INSPECTION VANE TESTER *H-60*



The **H-60** is a field inspection vane tester used to provide a rapid check of the stability of foundations, excavations and trenches in clay. It enables quick and easy determination of the undrained shear strength of clay. The instrument is strong enough to be used as a handle during penetration and retraction of the vane.

SPECIFICATIONS

Measurement range	0-200 kPa
Instrument	0.4 kg
Extension rod¹ length	0.5 m, for a weight of 0.3 kg
Vane 16 × 32 mm	0.05 kg
Vane 20 × 40 mm	0.05 kg
Vane 25.4 × 50.8 mm	0.06 kg

¹ 6 extension rods included allow depth measurement up to 3 meters

POINT LOAD TESTER *PIL-7*



The **PIL-7** is a point load tester designed to determine the point load strength index. This index provides a method to establish rock strength classification. The PIL-7 is a rugged system armoured with a shield to protect from flying chips upon failure. It is portable and strongly built with conical platens conforming to ISRM suggested method.

SPECIFICATIONS

Maximum specimen size	102 mm
Maximum load	70 kN
Pressure gauge range	100 000 kPa
Pressure gauge accuracy	±0.2% F.S.
Weight	25 kg



Elorn Bridge (France) | Oulmes Church (France) | Ertan Dam (China) | Freeport LNG Storage Facilities – Four different views (USA)

BOREHOLE DILATOMETER (ROCK PRESSUREMETER) *PROBEX*



The **PROBEX** dilatometer is a radially expandable borehole probe used to determine, in-situ, the modulus of elasticity of soft and moderately hard rocks. Tests run with the PROBEX can reach working pressures of 30 000 kPa. The probe is inflated hydraulically by means of a two-way ram, and deformation readings are obtained by monitoring the displacement of the twin pistons.

SPECIFICATIONS

Maximum working pressure	30 000 kPa
Probe type	Volumetric measurement, monocellular
Probe diameter	74 mm
Moduli range	100 to 30 000 MPa approx.
Loading	Hydraulic

PRESSUREMETER *TEXAM*



The **TEXAM** is a pressuremeter used to run in-situ loading tests at various depths on a routine basis. It has been developed to offer an easier-to-operate type of pressuremeter. Cyclic and creep testing can be performed with this type of pressuremeter. It is a reliable instrument for the evaluation of most ground engineering problems.

SPECIFICATIONS

Maximum working pressure	10 000 kPa
Probe type	Volumetric measurement, monocellular
Probe diameter	44 mm, 74 mm (A and N sizes)
Weight	58 kg (including tripod)
Dimensions (control unit)	52 cm × 31 cm × 46 cm
Moduli range	1 to 2000 MPa approx.
Loading	Hydraulic

PRESSUREMETER *TRI-MOD-S*



The **TRI-MOD-S** is a pressuremeter used to measure the in-situ strength and stress-strain properties of stiff soils and soft rocks. It stands out from the other pressuremeters by allowing tests to 20 000 kPa. It measures diametric changes, allowing anisotropy measurements.

SPECIFICATIONS

Maximum working pressure	20 000 kPa
Probe type	Diametric measurement, monocellular (strain gauge cantilevered arms fitted)
Probe diameter	74 mm (N size)
Moduli range	30 to 15 000 MPa approx.
Loading	Hydraulic

READOUT & DATALOGGERS



PORTABLE DATALOGGER *ACCULOG-iX*



The **ACCULOG-iX** is a user-friendly portable datalogger and readout unit designed to read tiltmeters, LVDTs, potentiometers, strain gauges, thermistors and 4-20mA transducers. The unit is ready to use in the field, even in harsh environments. Six function keys allow the operator to navigate within menus and options while configuring measurements directly on the unit.

SPECIFICATIONS

Resolution	40 μ V (analog), 20 bits (digital)
Display	240 \times 128 pixels, LCD CCFL backlit
Memory	2 GB SD memory card ¹
Autonomy	15 hours with LCD CCFL on backlit

¹ See specifications on technical data sheet

FIBER OPTIC MULTI-CHANNEL SYSTEM *BUS*



The **BUS** system is a multi-channel simultaneous conditioner for Fabry-Perot fiber optic transducers. It is designed to offer speed and versatility by allowing simultaneous measurements at sampling rates of up to 1000 Hz per channel. The BUS system comes in a 19-inch industrial rack chassis to house from 1 to 8 channels. Different sampling rates for each channel can be set individually.

SPECIFICATIONS

Precision	0.05% F.S.
Number of channels	1 to 8
Sampling rate	100 Hz, 500 Hz, 1000 Hz
Analog output	\pm 10 Volts with BNC connector
Operating temperature	-20°C to +40°C

DUAL-CHANNEL DATALOGGER *DL-200*



The **DL-200** is a rugged, user-friendly Dual-Channel Datalogger for all types of vibrating wire sensors and their internal temperature sensors. It is housed in a weather-resistant Nema 4X enclosure. Power is supplied by two easily accessible 'AA' batteries or two NiMH rechargeable cells that give a typical autonomy of up to 5 months. Built in non-volatile memory allows for the storage of 32 000 readings. The firmware is field upgradeable via RS-232 and a proprietary communication protocol. The unit is also available in Single-Channel version (DL-100). Default configuration includes USB (1.1 compatible) and RS-232.

SPECIFICATIONS

Resolution	0.01 μ s (wire) 0.1°C (temperature)
Data memory	64 Mb non-volatile flash memory
Temperature range	-40°C to +85°C

FIBER OPTIC MULTI-CHANNEL FIELD DATALOGGER *FODL – 1600/3200*



The **FODL – 1600/3200** is a unique datalogger designed for applications that require continuous monitoring of a large number of fiber optic sensors. It is fully compatible with the Fabry-Perot fiber optic transducers. The FODL – 1600/3200 comes in a 16 or 32 channel version mounted in a Nema 4X enclosure. The FODL – 1600/3200 can store up to 50 000 samples that can be discrete or averaged readings.

SPECIFICATIONS

Precision	0.025% F.S.
Number of channels	16 or 32
Sampling rate	20 Hz
Operating temperature	-20°C to +40°C
Power consumption	5 W



Neves-Corvo Mine (Portugal) | Wolsong Nuclear Power Plant (South Korea) | Butgenbach Dam (Belgium) | Esplanade Riel – From four different angles (Canada)

PORTABLE DATA ACQUISITION SYSTEM *DL-1600*



The **DL-1600** is a portable datalogger housed in a light and robust, splash-proof, shock resistant ABS plastic case. The unit is completely watertight with the cover closed. The DL-1600 is capable of measuring and storing data from several types of sensors such as linear potentiometers, LVDTs, 4-20mA transducers, temperature sensors and any other type of transducer with output voltage ranging between 0 and +/- 5.00.

SPECIFICATIONS

Analog input	4 differentials or up to 8 single-ended
Excitation output	2 switched excitations, active during measurement
Voltage	9.6 to 16 V
Dimensions	40 cm x 35 cm

FIBER OPTIC SINGLE-CHANNEL PORTABLE READOUT *FOR-1*



The **FOR-1** is a single-channel datalogger designed to read any Fabry-Perot fiber optic transducers. It can store up to 50 000 data samples, and the front panel is equipped with a display for programming logging sequences, durations and other operational parameters. Battery-powered, the FOR-1 adjustable analog output offers the possibility to connect to conventional loggers or monitoring systems.

SPECIFICATIONS

Precision	0.025% F.S.
Number of channel	1
Sampling rate	10 Hz
Operating temperature	-20°C to +40°C

VIBRATING WIRE READOUT *MB-6T & MB-6TL*



The **MB-6T** is a portable readout unit designed to read most existing vibrating wire gauges and thermistors on the market. This unit is battery operated with an autonomy of over 20 hours continuously. The MB-6TL is a datalogger version supplied with a MBtalk PC compatible software. A MSHA approved version is also available for mine environment.

SPECIFICATIONS

Preprogrammed thermistor	2, 3 and 10 kΩ
Battery	12 VDC, 2.3 Ah, rechargeable
Memory	128 kB static RAM
Autonomy	20 hours (10 hours with backlight)

MuST DYNAMIC READING UNIT



The **MuST Reading Unit** is a fiber Bragg grating demodulator based on the proven scanning laser engine. It can be integrated in weather tight steel housing and is used for permanent installation, allowing dynamic and static measurements for up to 4 or 16 sensor strings. The MuST reading unit is designed for a variety of demanding small and large scale industrial and civil engineering applications.

SPECIFICATIONS

Repeatability, resolution	0.2 pm (0.2 με / 0.02°C)
Stability	1 pm, (1 με / 0.1°C)
Wavelength range	1520 to 1590 nm
Maximum number of FBG sensors	40 per channel (depending on type)
Number of channels	4 (8 or 16 optional)
Measurement frequency	1000 Hz

READOUT & DATALOGGERS



MuST LIGHT READING UNIT



The **MuST Light Reading Unit** is a fiber Bragg grating demodulator based on the proven scanning laser engine. It can be integrated in a weather tight steel housing and used for permanent installations. It measures up to 4 or 16 sensor strings. The MuST Light reading unit is designed for a variety of demanding small and large scale industrial and civil engineering applications.

SPECIFICATIONS

MuST Light Model 500:

Repeatability, resolution	0.2 μm (0.2 μe / 0.02°C)
Stability	1 μm , (1 μe / 0.1°C)
Wavelength range	1510 to 1590 nm
Maximum number of FBG sensors	40 per channel (depending on type)
Number of channels	4 (8 or 16 optional)
Measurement frequency	1 Hz or 5 Hz

DATA ACQUISITION SYSTEM *OutDAQ™ 3300 RTU*



The **OutDAQ™ 3300 RTU** is an automated measurement system that interfaces to a variety of sensing devices in difficult field environments. It is compatible with existing or new SCADA host software or drivers supporting Modbus protocols.

SPECIFICATIONS

Input power:

Voltage	7–30 Vdc isolated or negative ground
Current (@12 V supply)	4 mA idle; 35 mA active

Environmental:

Operating temperature	-40°C to +70°C
Humidity	0 to 95% RH, non-condensing

PNEUMATIC PRESSURE INDICATOR *PR-20 & PR-20D*



The **PR-20** is a portable pneumatic pressure indicator designed to read pneumatic sensors from most manufacturers. It is mounted in a strong, watertight case containing a nitrogen-gas cylinder with a maximum pressure of 10 000 kPa. Easy to use with an automatic flow control valve, the PR-20D model comes with a high precision digital pressure gauge.

SPECIFICATIONS

Range	200 kPa to 10 000 kPa
Accuracy	$\pm 0.25\%$ F.S. (PR-20)
Operating temperature	-20°C to +60°C (PR-20)
Dimensions	45 cm \times 30 cm \times 18 cm

SWITCHING BOX *RT-VWSB*



The **RT-VWSB** is a switching box used to group multiple sensors in a single location providing a convenient mean of taking readings. It is designed to read 4 conductor sensors like the vibrating wire gauge with its thermistor. The RT-VWSB can handle up to twenty 4-conductors. Lightning protection for each sensor can be added as required.

SPECIFICATIONS

Overall dimensions	30.5 cm \times 20 cm NEMA 4X
Rotary switch	Sealed contacts
Contact resistance	50 M Ω max
Insulation resistance	1000 M Ω min
Options	Lightning protection, Multiplexer



DATA ACQUISITION SYSTEM *SENSLOG 1000X*



The **SENSLOG 1000X** is a datalogger used for remote monitoring. It is designed to read automatically any existing sensors on the market. The SENSLOG 1000X is well suited to operate in harsh environments that may also undergo extreme climatic changes. The capacity of the SENSLOG can be easily expanded by using the RTX-248 multiplexer.

SPECIFICATIONS

Analog input	8 differentials or up to 16 single-ended
Excitation output	3 switched excitations, active during measurement ¹
Voltage	11.5 to 16 V
Dimensions	41 cm × 36 cm

¹ See specifications on technical data sheet

SOFO READING UNIT & SOFO OPTICAL SWITCH



The **SOFO Reading Unit** is configured to read all SOFO sensors. Configuration 1 channel for manual measurements and 12 channels (or more) for automatic measurements. Its datalogger can be programmed to read the sensors automatically and to store the results. Data can be downloaded and processed remotely, using a modem. Available as portable or as rack mountable unit and is designed for harsh environments.

SPECIFICATIONS

Measurement resolution	2 μm RMS
Linearity / accuracy	<2‰
Measurement range	Max. 50 mm
Measurement drift	Below measurement resolution
Measurement time	<10 s
Available channels	1, 12 and with external switch up to 100, cascaded up to 1000 channels

SOFO BEE READING UNIT



The **SOFO Bee Reading Unit** contains the optical and computing equipment needed to measure all SOFO sensors. It is integrated in a compact steel housing and designed for permanent installation and is a convenient solution where long-term continuous static monitoring of structures is required. By connecting a modem, data can be downloaded and processed remotely.

SPECIFICATIONS

Measurement resolution	2 μm RMS
Linearity / accuracy	<2‰
Measurement time	<10 s
Available channel count	12 or 24
Datalogger capacity	10 000 measurements

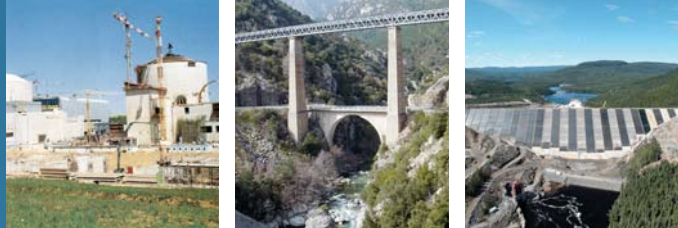
SOFO DYNAMIC READING UNIT



The **SOFO Dynamic Reading Unit** allows to measure SOFO sensors at high frequencies. A demodulator with a new acquisition concept (heterodyne – low-coherence interferometer) allows SOFO standard sensors to reveal dynamic measurements at a maximum frequency of 1 kHz measuring 8 sensors at the same time. This permits to equip structures with sensors that provide combined static and dynamic monitoring.

SPECIFICATIONS

Bandwidth	0 (true DC deformation) to 1 kHz (up to 10 kHz on special request)
Measurement range	±5 mm (maximum deformation)
Strain rate	±10 000 μm/s (maximum deformation speed)
Resolution	0.01 μm
Number of channels	8



FIBER OPTIC MULTI-CHANNEL TABLETOP DATALOGGER *UMI*



The **UMI** is a tabletop, multi-channel datalogger designed to read any Fabry-Perot fiber optic transducers. It comes in a 4 or 8-channel version and can be programmed via the front panel interface or through the RS-232 port. The UMI has a non-volatile memory buffer that can store up to 50 000 data samples. Each channel has a dedicated $\pm 5V$ adjustable analog output.

SPECIFICATIONS

Precision	0.025% F.S.
Number of channels	4 or 8
Sampling rate	20 Hz
Analog output	± 5 Volts
Operating temperature	-20°C to $+40^{\circ}\text{C}$



DiTemp FIBER OPTIC DISTRIBUTED TEMPERATURE MONITORING SYSTEM



This Raman scattering based reading unit is designed for distributed temperature measurements over distances up to 10 km providing excellent temperature resolutions and performances. The spectral analysis combines measuring the propagation time of the laser pulses along the fiber and the known speed of the light in the fiber. The high speed of the light allows scanning long fiber lengths within fractions of seconds. Designed for reliable long-term temperature measurements in industrial and civil engineering applications.

SPECIFICATIONS

Measurement range

Short range	0 to 5 km
Medium range	0 to 8 km
Long range	0 to 10 km

Optical fiber type Multimode

Spatial resolution¹ 1 m typical

Temperature measurement range
 -25°C to +80°C (ordinary temperature sensing cable)
 -25°C to +300°C (high temperature sensing cable)

Temperature resolution¹ at 1 km for spat. res. of 1 m
 0.2°C (measuring time 10 seconds)
 0.1°C (measuring time 1 minute)
 0.025°C (measuring time 10 minutes)

Acquisition time¹ Min. 10 seconds, typ. 2 min.

Number of channels 1, 2, 4 or 8

¹ Values depend on each other

TEMPERATURE SENSOR FOT



The FOT is a fiber optic temperature sensor used mainly for temperature measurements in harsh environments. Miniature and rugged, it may be embedded in concrete or installed in open air. Intrinsically safe, it is immune to EMI, RFI and lightning.

SPECIFICATIONS

Range -40°C to +300°C (cable dependent)

Resolution 0.1°C

Connection NPT stainless steel male fitting, 1/8 or 1/4 in.

TEMPERATURE SENSORS TH Series



The TH is a temperature sensor used to monitor temperature in rock, concrete, soil or grout. Applications include the monitoring of dams, bridges, buildings and tunnel linings. It also provides a reliable method to monitor the influence of temperature on instruments. The simple and rugged design allows direct embedment in fresh concrete or grouting in boreholes. Its sensing element can either consist of a 3kΩ chip thermistor, a platinum resistor or a thermocouple.

SPECIFICATIONS

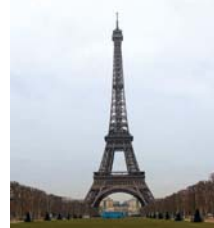
Temperature range¹ -60°C to +400°C

Accuracy¹ ±0.5% F.S.

Resolution¹ 0.1°C

Thermal drift 0.385 Ω / °C (TH-PT100)

¹ Depending on sensor type



THERMISTOR STRING *TS Series*



The Thermistor String Model TS is a multi-conductor cable with individual temperature sensors distributed along the cable. The chains can be submerged underwater as well as underground. The cable is flexible even at low temperature. The thermistor used in the string has a good stability over time. The temperature value can be obtained from a portable handheld readout instrument or a complete datalogger system.

SPECIFICATIONS

Temperature range¹	-80°C to +75°C
Thermal drift at 25°C	Less than 0.01°C after 100 months
Submersion	Up to 200 m deep (IP68)

¹ Depending on sensor type



ELECTRICAL CABLES



Instrumentation cables are used with most of our electrical transducers in a wide variety of applications and environments.

SPECIFICATIONS

OD	3.7 mm to 12.7 mm
Outside jacket	PVC, polyethylene or rubber
Temperature	-20 to +80°C

TRANSMISSION LINE VIBRATION RECORDER AND ANALYSER *PAVICA*



The **PAVICA** is a unique, small, lightweight instrument used to monitor and analyse vibrations in overhead transmission lines. It is intended to evaluate the in-situ vibration response of different line designs, tensions and hardware, and to estimate the nominal life expectancy of classical conductors. The unit is designed to be mounted directly on conductors.

SPECIFICATIONS

Measuring principle	IEEE Bending Amplitude Standard
Sensor type	Strain-gauged cantilever beam
Operating temperature	-40°C to +85°C
Dimensions	18 cm × 13 cm × 7 cm (nominal)

CONCRETE CORROSION SENSOR *SENSCORE*



The **SensCore Corrosion Sensor** measures two critical parameters for the evaluation of the corrosion condition of a reinforced concrete structure: corrosion initiation and corrosion rate. Those two measurements are performed at 4 different depths, between the concrete surface and the reinforcement bars depth. This allows the evaluation of the corrosion front progression. This sensor is designed for installation in new structures or for repair work, when the concrete cover is replaced.

SPECIFICATIONS

Sensor material	Ordinary uncoated dummy rebar (mild steel) Stainless steel (holder)
Dummy rebar length	60 mm
Dummy rebar diameter	8 mm
Dummy rebar position	4 positions up to 80 mm depth First rebar at adjustable depth
Connecting cable length	5 m (can be shortened during installation)



3DeMoN LASER



The **3DeMoN Laser** allows permanent monitoring of millimeter-scale movements. The measurements are performed between the laser distance meter and remote reflective targets (if needed). Its modular design allows chaining up to 10 laser instruments and it is ideal for geotechnical and civil engineering applications.

SPECIFICATIONS

Max. distance	0.2 m–1 km ¹
Achievable accuracy (standard deviation)	±0.2 mm (indoor measurements) ±1.5 mm (outdoor measurements)
Measurement time	0.3–4 sec. ¹
Targets	
0.2 m–50 m	None
50 m–400 m	Reflecting target or surface
>400 m	Geodetic prism may be needed

¹ Depending on reflective target type and on-site conditions

3DeMoN ROBOVEC

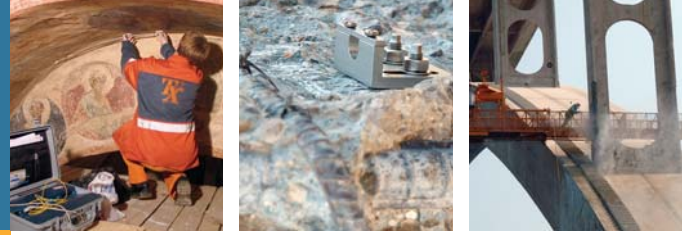


The **3DeMoN ROBOVEC** unit is based on a laser distance meter and a biaxial modular robotization for horizontal and vertical orientation of the instrument. It is designed for continuous, short-long-term monitoring of the 3D position of significant/strategic points. It measures distances, horizontal and vertical angles for an unlimited number of points. It is easy to use and allows flexible choice of the number of points to monitor, providing also automatic compensation of temperature and light effects on the measurements.

SPECIFICATIONS

Distance measurement accuracy	±0.2 mm (indoor measurements) ±1.5 mm (outdoor measurements)
Angle measurement resolution	0.0013°
Measurement range	0.2–1km
Measurement time	5–10 s for each target ¹
Targets	
0.2 m–50 m	None
50 m–400 m	Reflecting target or surface
>400 m	Geodetic prism may be needed

¹ Depending on reflective target type and on-site conditions



DIVIEW SOFTWARE



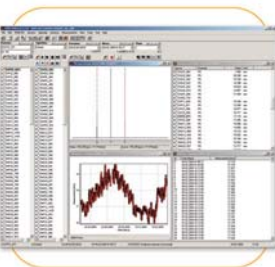
The Distributed Data Management and Analysis Software DiView is an integral and fully compatible part of distributed monitoring systems. In particular, it is designed for data storing, processing, representation and analysis, as well as for the control of single or multiple DiTeSt and DiTemp reading units. DiView is also used to store and manage data in a centralized interface.

DYMON SOFTWARE



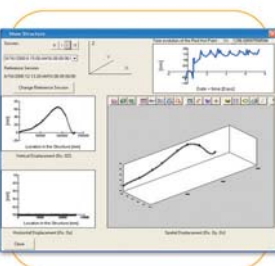
The Dynamic Data Management Software DyMon is an integral and fully compatible part of FBG-based monitoring systems. In particular, it is designed for data storing, processing and representation, as well as for the control of single or multiple MuST Dynamic reading units.

SOFO SDB SOFTWARE



The SOFO SDB Software is an integral part of all Smartec monitoring systems. It is easy to use, designed for powerful interoperability and access to the monitoring data using one single database structure. Data can be easily exported to advanced SDB software packages for data management, visualization, online publishing and analysis.

SOFO SDB SPADS



SOFO SDB Spads (Spatial Displacement) is used to retrieve from the SOFO SDB database spatially deformed shapes and spatial displacement of structures composed of linear elements, such as beams, girders, bridges.



SOFO SDB VIEW



SOFO SDB View Software is used to integrate into the same SOFO SDB framework pictures, tables or plots which immediately display, highlight or outline measurement values and, additionally, it features warning and threshold data management. It is also used to publish monitoring data on the web, to generate warnings based on different conditions and to simplify the export of data to Excel.

Informations & Technical Support

For any customer service inquiry or technical support questions

Americas - Asia

Roctest Ltd.
665 Pine Avenue
St.Lambert, QC
J4P 2P4
CANADA
Phone: 1-450-465-1113 / 1-877-ROCTEST (762-8378)
Fax: 1-450-465-1938
Email: info@roctest.com
Web: www.roctest.com
Office hours from 8am to 5pm (local time), Monday to Friday

France - Africa

Telemac SAS
10 Eiffel Avenue
77220 Gretz-Armainvilliers
FRANCE
Phone: +33 1 64 06 40 80
Fax: +33 1 64 06 40 26
Email: telemac@grouproctest.com
Web: www.telemac.fr
Office hours from 8am to 5pm (local time), Monday to Friday

Europe - Middle East

Smartec SA
Via Pobiette 11
6928 Manno
SWITZERLAND
Phone: +41 91 610 18 00
Fax: +41 91 610 18 01
Email: smartec@grouproctest.com
Web: www.smartec.ch
Office hours from 8am to 5pm (local time), Monday to Friday

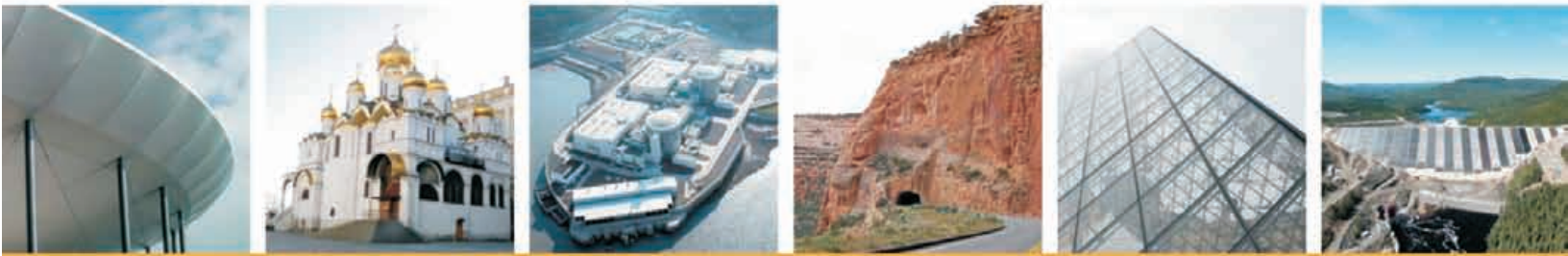


Rental Equipment

- n Data Acquisition System
Model SENSLOG 1000X
- n Dilatometer
Model PROBEX, DMP95
- n Extensometers
Model EXTENSOFOR, R-4
- n Fiber Optic Multi-Channel System
Model BUS
- n Fiber Optic Multi-Channel Field Datalogger
Model FODL – 1600/3200
- n Fiber Optic Single-Channel Portable Readout
Model FOR-1
- n Inclinator Probe and Readout
Model RT-20 & ACCULOG-iX
- n Packers
- n Pneumatic Pressure Indicator
Model PR-20
- n Pressuremeter
Model G-AM, TEXAM
- n Vane Borers
Model M-1000 (NILCON) with or without a rig
- n Readout
Model MB-6T, PFC10, PC6, FC5

Other products available through us:

- Avongard Tell-Tales Crackmeters
- Borros Hydraulic Anchors
- Convergencemeter Model COR
- Geosig Accelerographs & Seismographs
- Geotech Sounding Rigs & Penetrometers
- Hammer Penetrometer Model PEM
- Handsounding Static Penetrometer Model HSA-5
- Instantel Vibration Monitors (in Canada)
- Mechanical Packer (OBM), Inflatable Packers (YEP)
- Meteo Systems
- Optical Coordinoscope Model MVR
- Pressuremeter Model Pencil
- Reflex Borehole Survey Instruments
- Soil Moisture Equipment
- Strain Gauge Readout Unit
- Weir Plate



Instrumentation, In-Situ Testing and System Integration

Roctest Ltd.

665 Pine Avenue
St.Lambert, QC J4P 2P4
CANADA

Phone: 1-450-465-1113
Toll Free: 1-877-ROCTEST
Fax: 1-450-465-1938

Email: info@roctest.com
Web: www.roctest.com

Telemac SAS

10 Eiffel Avenue
77220 Gretz-Armainvilliers
FRANCE

Phone: +33-1-64-06-40-80
Fax: +33-1-64-06-40-26

Email: info@grouproctest.com
Web: www.telemac.fr

Smartec SA

Via Pobiette 11
CH-6928 Manno
SWITZERLAND

Phone: +41-91-610-18-00
Fax: +41-91-610-18-01

Email: smartec@grouproctest.com
Web: www.smartec.ch

Roctest Inc.

PO Box 3568
Champlain, NY 12919-3568
USA

Phone: 1-440-463-4888

Email: info@roctest.com
Web: www.roctest.com

Geotechnical and Environmental Investigations

EN.OM.FRA. SA

6-8 Eiffel Avenue
77220 Gretz-Armainvilliers
FRANCE

Phone: +33-1-64-06-47-76
Fax: +33-1-64-06-47-59

Email: info@enomfra.fr
Web: www.enomfra.fr

Marketed by :



PT. TEKNINDO GEOSISTEM UNGGUL

1st Floor, Wisma SIER Building
Jl. Rungkut Industri Raya 10, Surabaya 60293
INDONESIA

Phone: +62-31-8475062
Fax: +62-31-8475063

Email: info@geosistem.co.id
Web: www.geosistem.co.id

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