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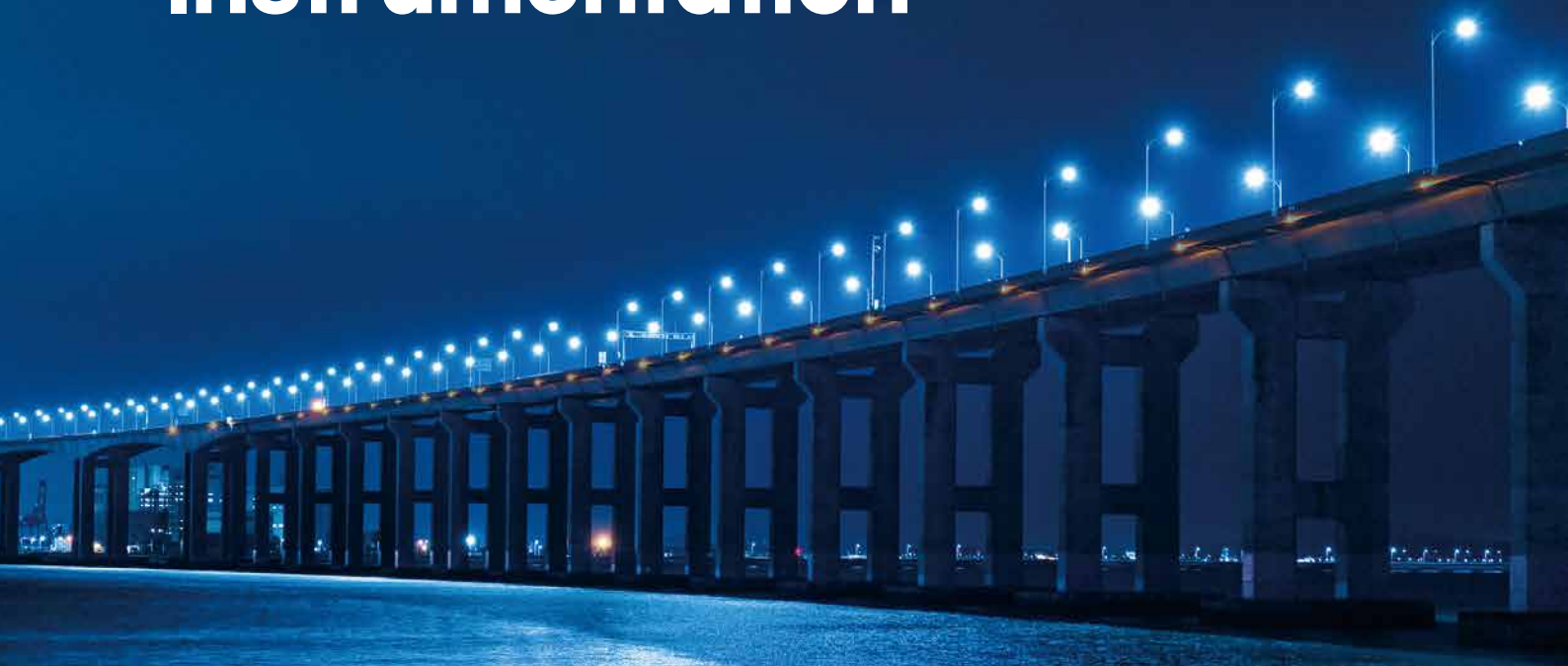
2026

Geotechnical & Structural Instrumentation



Civil engineering solutions

Structures & Power plants | Bridges | Dams
Tunnels | Piles | Marin structures | Foundations
Slope stability | Landfills | Excavations
Embankments | Ground water | Railway & Roadway

ACE Instruments
ACE INSTRUMENT
Geotechnical Sensors & Smart Solutions

ACE INSTRUMENT

Geotechnical Sensors & Smart Solutions

ACE INSTRUMENT CO., LTD. which are a group of experts for geotechnical instrumentation are exported to more than 30 countries and supply the civil engineering industry. We are producing our products to use in construction site, rock, environmental instruments with using our data loggers, operating software to check design validation and safety construction.
Our company hopes to develop new products and technologies through challenge and innovation to create a new future.

Gunpo Head Office Factory

Paltan Factory

Products

Our produced geotechnical instruments are used that dams, tunnels, railways, bridges, roads, soft ground improvement work, pile test to measure load, stress, strain, earth pressure, water level, pore pressure, slope angle, physical feature of a base rock.
In addition, we also produce the in-situ test equipment, hydraulic cell for pile load test and variety of data loggers and analysis software.

Technology

ACE INSTRUMENT CO., LTD. has a world-class design, manufacturing tuning, calibration technology and output value for a vibrating wire sensor suitable for semi-permanent measurement and a strain gage sensor suitable for research purposes such as dynamic characteristic detection and model testing due to excellent responsiveness and stability. There is a variety of digital calibration equipment available for checking.
Since our products are manufactured according to **CE certification, ISO-9001** Quality management system, we supply the highest quality products with high reliability. All of our measuring instruments have been supplied to the construction sites of 50 or more dam sites that have to measure more than 50 years, including Turkiye, Iran, Indonesia, Vietnam and so on. In addition, the various measuring instruments of our company are supplied to construction sites of nuclear power plants that require high reliability, such as Areva, France. All geotechnical instruments produced by our company are CE certified.

Service

- Manufacturing geotechnical & structural instrumentation, the readout unit, data logger, LoRa system
- Installing & supervising service of the geotechnical sensor and the data logger.
- Developing the various analysis software for civil engineering monitoring.
- Technical support for geotechnical engineering.
- Facilities rental service for civil engineering.
- Inspection & calibration of sensor and facilities.
- Web monitoring program service

Quality

Our company has been certified by ISO-9001 quality management system in the design, development, manufacture and service of geotechnical instruments.
Through quality management and quality innovation, we guarantee the quality and pursue the service organization in order to impress the customers. It also complies with the **ISO-17025** international standard.

CERTIFICATE OF REGISTRATION

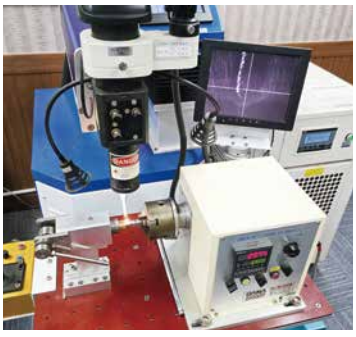
Quality Management System

ACE INSTRUMENT Co., Ltd.

KS Q ISO 9001:2015 / ISO 9001:2015

Scope of Certification

CE



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01 Web monitoring programs

We supply two Web monitoring programs: **W-Pro**, a static program exclusively for data loggers, and **S-Pro**, a program exclusively for Smart LoRa system.

Web monitoring program is for sharing the information and for supporting the prompt decision-making with the person concerned under construction at a site. The measured data is saved to the server computer by internet network. It is program that drawing up the measuring report, making a graph of engineering unit, giving an alarm, and lookup of a real-time measuring data are possible on the basis of the saved data.

02 Smart loggers

ADL-200A smart logger is our company's top model static data logger. It is a full range logger that connects 16-channel vibrating wire sensors and 16-channel analog sensors (temperature sensor, mV sensor, FSG sensor, sequential serial communication sensor, etc.). **ADL-200B** is a model with smart multi-point inclinometer measurement function added to ADL-200A. Data loggers operate in proportion to the number of different types of sensors installed in the field. Therefore, even in small or large sensor installations, up to seven sets of Smart Logger ADL-200A can be controlled by zigbee wireless or wired communication. Up to 112 vibrating wire sensors and 112 analog sensors can be connected and controlled in a single system simultaneously.

Model	**ADL-200A**	**ADL-200B**
Applied sensor	VW, mV, FSG, temperature and serial communication sensor	Smart multi-point inclinometer (Added to ADL-200A)
Sensor channel	VW sensor 16ch, analog sensor 16ch	VW sensor 8ch, analog sensor 8ch, smart multi-point inclinometer 8ch
Accuracy	VW sensor 0.05% FSR, analog sensor 0.1% FSR	
Input	12 VDC	
Logger max. connection quantity	7set / 112 Ch	

03 Smart LoRa systems

The model **Smart LoRa system** applies LoRa (Long Range), a low-power and long-distance communication method, to transmit sensor data measured by various types of sensor modules to a network server through a gateway. The system configuration consists of a sensor module that measures and wirelessly transmits data from sensors, a gateway that transmits the received data to the server, a network server that stores the transmitted measurement data, and a web-based monitoring program that analyzes and manages the stored measurement data.

Model	Analog sensor module		VW sensor module		Smart multi-point inclinometer module
	AL1 (1ch)	**AL4** (4ch)	**VL1** (1ch)	**VL4** (4ch)	**ML1** (1ch)
Applied sensor	mV sensor mA sensor		VW sensor		Smart multi-point inclinometer (model 4491)
Accuracy	±0.05% FSR				
Input	DC 3.6V 19000mA (D-size) Lithium battery				
Use time (1hour reading)	5 Years	3 Years	5 Years	3 Years	1 Years (Depend on sensor quantities)
Gateway communication method	LoRaWAN local network				
Gateway communication distance	City area : average 1km, Open area : max. 6km				

04 LoRa tiltmeter, crackmeter

The **LoRa tiltmeter**, **crackmeter** utilizes low-power, long-distance LoRa communication technology to transmit sensor data measured at the sensor module in real time to a network server via a gateway for monitoring purposes. The **TCL** model module, including the tiltmeter and crackmeter, connect the built-in digital 3-axis MEMS tiltmeter and potentiometric crackmeter to the analog input port, allowing them to simultaneously measure the tilt angles of a structure and the width of cracks. This product is very useful in safety diagnosis sites and is also the optimal choice for slope sites with small installations.

Model	Tiltmeter, Crackmeter			
	TCL (4ch)			
Applied sensor	3-Axis MEMS sensor			Crackmeter(model 4335)
Measurement range	±10°	±30°	±85°	20mm
Accuracy	±0.1% FSR			±0.5% FSR
Input	DC 3.6V 19000mA (D-size) Lithium battery			
Use time (1hour reading)	5 Years			
Gateway communication method	LoRaWAN local network			
Gateway communication distance	City area : average 1km, Open area : max. 6km			

05 Dynamic data logger

ADL-300 dynamic data logger can measure dynamic data by connecting FSG(foil strain gage) sensor, voltage(mV) and current(mA) sensor. It is manufactured separately for FSG sensor and voltage sensor. There are dynamic measurement mode and static measurement mode functions, so it can be changed and used according to the site situation. In dynamic measurement mode, one ADL-300 dynamic data logger can be directly controlled from a PC. In static measurement mode, ADL-300 can be connected and controlled by up to 16 units by applying RS-485 communication.

Model	**ADL-300**
Applied sensor	FSG, mV, mA sensor
Sensor channel	8ch
Sampling rate	10, 20, 50, 100, 250, 500Hz/sec
Logger max. connection quantity	16set (128ch)
PC interface	USB, RS-232, RS-485

06 VW mini loggers

ACE-1100 VW mini logger connects to 1 VW sensor, it can automatically measure it with high precision and low cost for a long time. **ACE-1104** can connect to 4 VW sensors. VW mini logger is useful for unmanned operation, connecting the vibrating wire sensor individually such as few VW displacement sensor, VW piezometer, VW crackmeter on site for the safety check, measuring the water level. Data can stores 6000 points and selects frequency signal & temperature sensor, it boasts highest performance and confidence among contemporary mini loggers regardless of country.

Model	**ACE-1100**	**ACE-1104**
Applied sensor	1ch vibrating wire sensor	4ch vibrating wire sensor
Frequency range	450 ~ 6000Hz	
Resolution	0.1Hz	
Accuracy	0.02% FSR	
Memory	6000 point read / record	32000 point read / record

07 VW readout unit

ACE-800 VW readout unit is the smallest, and has one of highest in the world. It can be accessed to vibrating wire sensor. ACE-800 is the best class type product that has no anxiety of defect by using four membrane switches, it is easy to measure due to concurrent display mode, the remaining battery lifetime, RTD, the thermistor temperature and the selected frequency units by using the large screen. ACE-800 also can implement the measurement at night time with backlight function, and it can be used for 40 hours continuously with one time charge, and it is the world best product that can be used in any unfavorable condition because of being manufactured with ABS case.

Model	**ACE-800**
Applied sensor	Vibrating wire sensor
Frequency range	450 ~ 6000Hz
Displayed units	Hz, μsec, 10^3Hz^2, ˚C, με0.391, με0.7756, με3.304, με4.062
Resolution	0.1Hz / Temperature sensor 0.1˚C
Accuracy	0.02% FSR

08 VW data recorder

ACE-1000 VW data recorder for the specialist that can read VW sensor, store by its number, and transmit the data to computer by RS-232 communication and the exclusive program. It is the data logger with high reliability that can store 4000 points of measured values into max. 64ea of ID. It displays 5 types of engineering mode such as the Hz, 10^3Hz^2, μsec, μstrain, temperature with large screen, and built in backlight function, auto power break function.
ACE-1000 adopts the nickel hydrogen battery to measure for 30 hours continuously with one time charge, and ABS case for waterproof and impulse endurance.

Model	**ACE-1000**
Applied sensor	Vibrating wire sensor
Memory	Max. 64 ID / 4000 point
Frequency range	450 ~ 6000Hz
Displayed units	Hz, μsec, 10^3Hz^2, ˚C, με0.391, με0.7756, με3.304, με4.062
Resolution	0.1Hz / Temperature sensor 0.1˚C
Accuracy	0.02% FSR

09 VW display logger

ACE-1100D VW display logger is a 1ch logger that is a highly efficient data logger that can be used for long-term automated measurement and is also a displayer.
Data can be stored according to a schedule or checked directly by pressing a display button, which shows the values converted into engineering units, and automatic measurement can be performed for 6 months by connecting a vibrating wire sensor. ACE-1100D can be used by connecting battery or always power

Model	**ACE-1100D**
Applied sensor	1ch vibrating wire sensor
Frequency range	450 ~ 6000Hz
Resolution	0.1Hz / Temperature sensor 0.1˚C
Memory	32000 point read/record
Display	16×2 character LCD

10 FSG readout unit

ACE-600A FSG readout unit is an electrical sensor readout unit that connects to sensors that use FSG(Foil stain gage) as a sensing element.(so-called strain meter). The ACE-600A is easily accessible to any foil strain gage of 120Ω or 350Ω gage of input resistance full, half and quarter bridges. There is a max. 32ea of programming ID setting function. By setting the conversion coefficient, zero point, and unit of use for each ID, you can measure the final engineering unit value required by the user according to the set ID.

Model	**ACE-600A**
Applied sensor	FSG sensor (foil strain gage)
Bridge type	full bridge, half bridge, quarter bridge
Input resistance	120Ω, 350Ω
Resolution	1×10^{-6} strain
Accuracy	±0.1% FSR

11 Digital indicator

ACE-40D digital indicator is directly connected to our FSG load cell and displayed in units of direct load(ton·f), which can be useful for emergency situations or maintenance on site.
It is also possible to install indicators directly connected to FSG load cells in multiple locations in a multi-box.

Model	**ACE-40D**
Frequency range	-30 ~ +30 mV/V
Applied voltage	5 VDC
Sampling rate	50 time / sec
Accuracy	±0.1% FSR
Dimensions	150×150×100mm

12 MEMS readout unit

ACE-1500 MEMS readout unit which is a versatile readout unit can measure MEMS sensor, ELS(Electrolytic Level Sensor), voltage sensor(mV), current sensor(mA), thermistor and platinum resistance temperature sensor(PT-100). MEMS readout unit can output two sensors A and B at the same time. It can be used in checking battery residual, measurement voltage(mV), current(mA), thermistor and PT-100 temperature measurement, backlight function.

Model	**ACE-1500**
Applied sensor	MEMS, ELS, 4~20mA sensor, potentiometer PT-100, thermistor temperature sensor
Measurement range	±12V, ±5000mV, 4 ~ 20mA, -40 ~ 150℃
Accuracy	±0.1% FSR
Displayed units	V, mV, mA, ℃

13 MEMS mini logger

ACE-900 MEMS mini logger is developed specifically for MEMS (Micro Electro Mechanical System) tilt sensors and is designed as 2-channel to simultaneous measurement of 2-axis sensors. It is a mini data logger that can measure MEMS inclinometer sensor, voltage(mV) sensor and current(mA) sensor, also can do for long-term unattended automation.
The power supply is basically equipped with 4EA of C class alkaline batteries. It is designed with low power and can be used without battery replacement for 6 months.

Model	**ACE-900**
Applied sensor	MEMS, ELS, 4~20mA sensor, potentiometer
Measurement range	-12V ~ 12V / 4 ~ 20mA
Resolution	0.1mV / 0.001mA
Memory	30000 point
Input	6.0 VDC

14 Water level meter

4650 water level meter consists of a reel frame with a buzzer, light, graduated tape and probe. It is designed to activate the buzzer sound and indicator light when the probe is lowered down the borehole and comes into contact with water. An important element steel tape is reinforced with wire rope and then polyethylene coating is applied to make it strong and soft. There is no risk of disconnection or short circuit as the probe and tape connection parts are also mechanically treated. Semi-permanent precision measurement is possible. When using a stand pipe, it can be operated by installing a filter tip.

Model	**4650**	**4550** (magnetic indicator combined)
Measurement range	50m ~ 100m / 150m ~ 500m	
Resolution	1mm	
Weight	2.5 ~ 15kg	
Dimensions	152(W) × 278(L) × 282(H)mm / 400(W) × 400(L) × 400(H)mm	
Density / Material	50μm / PE or Ceramic filter	

15 Magnetic extensometer

4680 magnetic extensometer is used to measure a settlement or a heave in fills, foundations and dams. Magnetic extensometer consists of sensing rings, a magnet indicator, an access pipe, telescopic sections and an end is anchored in stable ground, the depth of each magnet is referenced to a datum ring that is fixed to the bottom of the access pipe. The sensing rings include plate ring, spider ring and datum ring. When a probe is lowered down inside the access pipe and enters a magnetic field, the lamp turns on and the buzzer rings. The tape is graduated in millimeter. The tape graduations refer to the depth of the sensing ring.

Model	**4680**	**4550** (water level combined)
Measurement range	50m ~ 100m / 150m ~ 500m	
Resolution	1mm	
Weight	2.5 ~ 15kg	
Dimensions	152(W) × 278(L) × 282(H)mm / 400(W) × 400(L) × 400(H)mm	

16 Terminal boxes

7012, 7024 terminal boxes can be wired inside the terminal box by tying the signal cables of measuring devices installed in several places in units of 5 to 12 between nearby sensors due to the nature of large civil works. Model 7012 can connect up to 12 sensors and Model 7024 can connect up to 24 sensors, which is useful in large sites or a large amount of sensor cable aggregation.

Model	**7012**	**7024**
Applied sensor	All type	
Connectional channel of sensor	Up to 12EA	Up to 24EA
Material	ABS case	
Dimensions	280×190×180mm	350×250×180mm
Weight	2.0kg	3.0kg

17 Surge module

ACE-SAM surge module is built in diode, arrester, protective PCB to remove the plasma and excess-current through the cable by the strong thunderbolt.
On the site where data logger with sensor is very significant and requires semi-permanent measuring, ACE-SAM is recommended to be attached on the sensor or logger.

Model	**ACE-SAM**
Applied sensor	All type sensor
Break down voltage	27 V
Peak current	10kA / Line, 20kA / Pair
Temperature range	-20 ~ 70℃
Response speed	Less than 1 nano-sec

18 Voltage amplifier

VA10 voltage amplifier is a device for restoring the strength of the measured voltage caused by the increase of the resistance of the cable core thickness and the drop of the DC voltage.
The output voltage of the voltage amplifier is normally 12VDC and should be attached to the cable extension every 500m for long distance transmission.

Model	**VA10**
Applied sensor	mV sensor
Output voltage	12 VDC
Min, amp voltage	3.3 VDC
Max. resistance	60Ω

19 RC casings

RC casing is a fitting-type structure processed by male and female without a connecting sleeve(coupling). The inner guide groove is a highly reliable, high-precision cutting casing processed in quarters by a broaching machine. The surface of RC casing is machined inside and outside diameter by CNC turnmill center. The connection part is a snap-in type and has a precise structure that does not come off when inserted. When inserting the RC casing for waterproofing and reinforcing the strength of the connection, be sure to apply ABS solvent to the surface before connecting. It is a high-strength product with very high breaking resistance as a product that shortens working time by eliminating the need for riveting or winding tape after bonding.

Model	RC70	RC85
Diameter	Φ59×Φ70mm	Φ73×Φ85mm
Cutting length	1555mm, 3055mm	
Spiral	Less than 0.3° / 3m	
Load test	More than 600kg·f	

20 SC casings

SC casing is as standard casing, highly reliable and precise product that the connected part between guide groove and coupling inside of the casing is processed. This product needs the coupling, and the external diameter of coupling is similar to the external diameter of the casing. This product is more fitted when the setting depth is deep, In case of installation, ABS solvent, POP rivet, and mastic tape are required. This product is highly reliable product that the proper intensity, the softness, and the twisted angle is guaranteed.

Model	SC70	SC85
Diameter	Φ59×Φ70mm	Φ73×Φ85mm
Coupling OD	Φ70mm	Φ90mm
Cutting length	1500mm, 3000mm	
Spiral	Less than 0.3° / 3m	
Load test	More than 320kg·f	

21 DC casings

DC casing is the high-precision casing which the guide grooves inside of inclinometer casing and the connecting parts of the coupling are proceed by a broaching machine. The outside surface of DC casing is proceed by CNC turnmill center, and it is finished by O-ring. DC casing is designed as snap-in type. So after taking off the protective tube of O-ring, it can be directly inserted. DC casing is possible to install quickly. ABS bond is unnecessary. And to rivet and to tape is unnecessary because DC casing is waterproof by O-ring.

Model	DC70	DC85
Diameter	Φ59×Φ70mm	Φ73×Φ85mm
Cutting length	1555mm, 3055mm	
Spiral	Less than 0.3° / 3m	
Load test	More than 320kg·f	

22 WC casings

WC casing is a high-reliability, high-precision cutting type product that processes all parts using a broaching machine and a CNC turnmill center. This product can be installed quickly by inserting the connecting wire into the casing connection part and it is waterproofed by O-ring, so subsequent processes such as riveting and tape are unnecessary.
There is no protrusion of the outer diameter of the casing at the connection.

Model	WC70	WC85
Diameter	Φ59×Φ70mm	Φ73×Φ85mm
Cutting length	1555mm, 3055mm	
Spiral	Less than 0.3° / 3m	
Load test	More than 230kg·f	

23 FC casings

FC casing is cut into a length of 3m from the finished casing in a plastic extruder. It is a flexible product with a twist angle of less than 0.5°/3m and a stiffness of 250kg·f or more.
FC casing is useful when the installation depth is less than 20m.
FC casing needs coupling when connecting. There are three types of FC-64, 70 and 85.
The outer diameter of the sleeve of the FC-64 casing is Φ70mm. It is easy to install because it fits into the inner diameter of a normal drilling drill NX (Φ76mm).

Model	FC64	FC70	FC85
Diameter	Φ53.6×Φ60.6×Φ64mm	Φ58×Φ66×Φ70mm	Φ72.2×Φ80.8×Φ85mm
Cutting length	3000mm		
Spiral	Less than 0.5° / 3m		
Load test	More than 250kg·f		

24 Water level meter stand pipe

Water lever meter stand pipe is manufactured to cut into a length of 3m from the finished casing of Φ38mm in a plastic extruder. Since it is made of the same ABS material as the inclinometer casing and has the same length of 3m, it can be installed using ABS solvents when connecting pipes.

Model	WL38
Diameter	Φ31×Φ38mm
Cutting length	1500mm, 3000mm
Load test	More than 250kg·f

25 Digital inclinometer

Digital inclinometer consists of a probe, a bluetooth cable reel and a cable guide. download and use native app for your android or iOS(iPhone) smartphone.
This product has the ultimate quality of ultra-light, high accuracy, high reliability and high response. The cable reel and smartphone are linked with bluetooth and can use for 40 consecutive hours. The operating app has data storage, data viewing and e-mail sending function.
Model **5481 vertical type** measures horizontal displacement using inclinometer casings, installed vertically by drilling. The model **5481H horizontal type** measures vertical displacement, such as settlement or heave in embankments or road fills. The model **5481T slope inclined type** is equipped with 2-axis MEMS inclinometer set at a 45˚ inclined plane inside, allowing measurement of slope settlement or heave in dam slopes or retaining walls.

Model	5481 (Vertical)	5481H (Horizontal)	5481T (Slope inclined)
Applied sensor	2-MEMS sensor	1-MEMS sensor	2-MEMS sensor
Measurement range	±30˚ (horizontal)	±30˚ (vertical)	±30˚ (45˚ inclined plane)
Resolution	0.005mm / 500mm		
System accuracy	±2mm / 25m		
Data logger	Android or iOS(iPhone) app. based smartphone		

26 Spiral sensor probe

Spiral sensor probe is useful to find out matching up between direction of inclinometer casing and direction of measuring. Also, this model can find out the twisting while connection with casing each.

Model	5480P
Applied sensor	Disposable integrated potentiometer
Measurement range	±10˚
Resolution	0.01˚
Accuracy	±0.5% FSR
Gage length	1000mm

27 Portable digital tiltmeter

Portable digital tiltmeter is a safety diagnostic measuring instrument for measuring the stability of building structure. It is light and simple with built-in 2-MEMS sensor, data logging circuit, and bluetooth circuit in the tiltmeter. Native app is downloaded and used on android or iOS(iphone) smartphone, so data loggers and jumper cables are unnecessary and provide innovative and convenient usability. The digital tiltmeter and smartphone are linked with bluetooth and can use 17 consecutive hours. The operating app has data storage, data viewing, and e-mail sending function.

Model	5411
Applied sensor	2-MEMS sensor
Measurement range	±30˚
Resolution	0.0005˚ (2arc seconds)
Accuracy	±10arc seconds
Data logger	Android or iOS(iPhone) app. based smartphone

28 MEMS beam sensor

MEMS beam sensor of model 5420 is manufactured with MEMS inclinometer put on aluminum pipe which has 1~3m of gage length. These are possible to measure the displacement through out calculation as gage length(L) times tilt and size or outline for settlement or heave when it is connected at end of model 5420.

Model	**5420V** (vertical)		**5420H** (horizontal)
Applied sensor	MEMS sensor		
Measurement range	±1°	±2°	±3°
Resolution	1arc seconds	2arc seconds	3arc seconds
Accuracy	±0.1% FSR		
Non-linearity	±0.5% FSR		
Gage length	1 ~ 3m		

29 VW inclinometer

VW inclinometer has superior the reproducibility, responsibility, and resolution because of transmitting the frequency signal, and so quite a precise measurement is possible as being affected by the variation of the temperature.
It can precisely measure the size of horizontal, vertical displacement connecting it on the 1~2m length of beam. And especially, it is useful when it is installed on the place that is affected by electrical noise such as subway and etc.

Model	**1410**	
Applied sensor	Vibrating wire sensor	
Measurement range	±5°	±10°
Resolution	5arc seconds	10arc seconds
Accuracy	±0.1% FSR	
Non-linearity	±0.5% FSR	

30 MEMS inclinometers

MEMS inclinometer is highly reliable because an amplification circuit is built into the MEMS type inclinometer developed by MEMS technology (micro-electro mechanical engineering technology and micro-reaction technology). It is very useful in sites which requires long-term measurement and in sites requiring automated measurement.

Model	**5310** (uniaxial)	**5310B** (biaxial)
Applied sensor	MEMS sensor	
Measurement range	±5° / ±10°	
Output	-5 ~ +5 VDC	
Accuracy	±0.1% FSR	
Non-linearity	±0.5% FSR	

31 VW vertical multi-point inclinometers

VW vertical multi-point inclinometer is a combination of several VW inclinometers using a wheel assembly and an extension tubes.
The advantage of the vibrating wire sensor is that it can be operated unmanned in real time using automated measuring equipment. The gage length is about 1~3m, so it can be installed in uniaxial when the displacement direction is expected. If the displacement direction is not expected it can be installed in biaxial. In addition, model 1430 is precision-processed using a waterproofing capacity of 20bar and a stainless steel anticorrosive material, allowing semi-permanent measurement.

Model	**1430U** (uniaxial)	**1430B** (biaxial)
Applied sensor	Vibrating wire sensor	
Measurement range	±5° / ±10°	
Resolution	5arc seconds / 10arc seconds	
Accuracy	±0.1% FSR	
Non-linearity	±0.5% FSR	

32 Smart multi-point inclinometers

Model **4491 smart multi-point inclinometer** is designed with a digital MEMS sensor kit mounted on a small stainless steel tube and a plastic molded structure. It is manufactured in a simple and lightweight structure by extending multiple sensor kits through one signal cable with a waterproof connector and transmitting them sequentially.

Model	**4491** (vertical)	**4491H** (horizontal)
Applied sensor	2-MEMS digital sensor	
Measurement range	±30°	
Resolution	4arc seconds	
Accuracy	±0.1% FSR	
Gage length	Selection of standard length 1, 2, 3m	

33 Pendulum system

Pendulum system of Model 8100 can measure the horizontal relative displacement between a dam and rock foundation at a vertical line. After installation of direct or inverted type of pendulum system, it is required to use CCD or photo sensor in order to decide the wire position inside of readout and send measured data to automatic readout.

Model	**8100**
Applied sensor	CCD (charge coupled device) / photo sensor
Measurement range	±75mm (manual) / 50mm (automatic)
Resolution	0.01mm
Accuracy	±0.1mm
Components	Inverted pendulum, Direct pendulum, Wire, Portable readout, Automatic readout

34 VW load cells

VW load cell is divided into 2 types as hollow type that has hollow interior, and strut specific solid type for the measuring the load being applied to support cable (strand), strut and earth anchor of the structures. We manufacture load cell of up to 1500ton. According to the applied load size, 3~6 pieces of VW strain gages are built in load cell, and it is manufactured into the highly reliable product through the validity verification by the proved universal testing machine.

Model	**1102 ~ 1170S**
Applied sensor	Vibrating wire sensor
Rated capacity	20 ~ 1500ton·f
Safe overload	150% FSR
Resolution	0.025% FSR
Accuracy	±0.1% FSR ~ ±0.5% FSR

35 FSG load cells

FSG load cell is divided into hollow type that has hollow interior, and strut specific solid type for the measuring the load being applied to tie back, rock bolt, earth anchor. We manufacture load cell of up to 1500ton.
Even if the eccentric loading is applied to FSG load cells, it independently readout into the automatically compensated value. And it can be used optimally when the pile load test or the dynamic measurement is being required. It is highly reliable product through the validity verification by the proved universal testing machine.

Model	**4102 ~ 4170S**
Applied sensor	FSG sensor (foil strain gage / 4~16 gages)
Rated capacity	20 ~ 1500ton·f
Resistance	700Ω
Safe overload	120% FSR
Rating output	1.5mV/V (1500×10^{-6})
Accuracy	±0.1% FSR ~ ±0.5% FSR

36 FSG large capacity load cells

FSG large capacity load cell is designed in column type or center hole type and are used for pile load tests or load measurement of high-load structures such as bridges. We manufacture from 500 to 1500ton. Foil strain gage is configured in the shape of a wheatstone bridge, so even when an eccentric load is applied, a single corrected value is output and dynamic measurement is possible. It is a highly reliable product through the validity verification by an authorized universal testing machine.

Model	**4201 ~ 4205**
Applied sensor	FSG sensor (foil strain gage / 8~16 gages)
Rated capacity	500 ~ 1500ton·f
Resistance	700Ω
Safe overload	120% FSR
Rating output	1.5mV/V (1500×10^{-6})
Accuracy	±0.1% FSR ~ ±0.5% FSR

37 FSG tension load cells

FSG tension load cells are constructed with a stainless steel body and foil strain gage attached. It is designed to measure the tensile load of wires and cables, but can measure both tensile and compressive loads.
There are three measurement ranges: 5ton, 10ton, and 20ton. Tension load and compression load can be measured respectively.

Model	4211	4212	4213
Applied sensor	FSG sensor		
Rated capacity	5ton·f	10ton·f	20ton·f
Resistance	700Ω		
Safe overload	120% FSR		
Rating output	2mV/V (2000×10^{-6})		
Accuracy	±0.5% FSR		

38 Hydraulic load cells

Hydraulic load cell is designed with a structure that allows you to check directly about the size of the changing load in tiebacks, rock bolts and support retaining walls used as support systems. Hydraulic load cell is welded to the outer periphery of two thin, precision-machined stainless steel plates. The inside is filled with oil. Hydraulic load cell has an analog type pressure sensor which connected directly to the cell body. The pressure sensor is calibrated in units of load by the effectiveness test of a high-precision load tester(UTM). It is designed in European style, which is optimal for use in the harsh conditions of civil engineering works.
In addition, an S type equipped with a VW pressure sensor is manufactured instead of an analog type pressure sensor.

Model	AH50P.R	AH75P.R	AH100P.R	AH150P.R	AH200P.R
Applied sensor	Analog manometer				
Rated capacity	50ton·f	75ton·f	100ton·f	150ton·f	200ton·f
Safe overload	120% FSR				
Resolution	2ton·f				
Accuracy	±1.0% FSR				

39 VW concrete stressmeter

VW concrete stressmeter consists of a load cell manufactured in the form of a flange, a plastic pore pipe forming a concrete cylinder, and a rebar screw cap for integration with the surrounding concrete.
The small load cell has a built-in vibrating wire strain gage and individually calibrates the load, so it can be converted to stress by applying the cross-sectional area of he concrete cylinder.

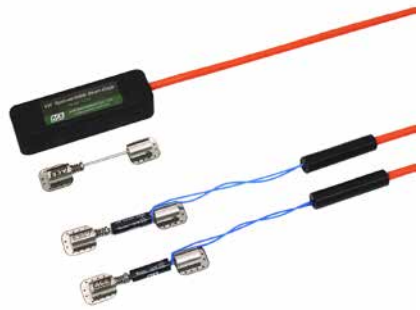
Model	1250
Applied sensor	Vibrating wire sensor
Rated capacity	-3 ~ 25MPa
Resolution	0.025% FSR
Accuracy	±0.5% FSR

40 Hydraulic cells for pile load test

We provide **Hydraulic cell and pump units** which are for pile load test.
We provide customized single acting and double acting hydraulic cell which can cover range of 200 ~ 1500ton·f (common pressure 1500bar)
Hydraulic cells are including leak tightness preventers and super high pressured airtight design. Also, we take 100% load test for each cell before consignment.

Model	Single acting	Double acting
Common pressure	1500bar (150MPa)	
Load	200, 300, 400, 600, 800, 1000, 1200, 1500ton·f	
Stroke	150mm (optional 100 or 200mm)	
Allowable pressure	2000bar (200MPa)	

41 VW spot weldable strain gages



Model **1210 VW spot weldable strain gage** is designed as the small size so that it can measure the strain at the steel structure such as bridges, piles, tunnel linings and buildings, after attaching it with spot welding or epoxy. Model **1215** is suitable for tie back, and soil nail as having the small structure that is connected plucking coil on the surface of gage. **1215A and B** are possible to measure wide range. Model **1215C** is manufactured in a structure that can adjust the measuring range.

Model	**1210**	**1215** (mini)	**1215A** (large range)	**1215B** (wide range)	**1215C** (adjustable)
Applied sensor	Vibrating wire sensor				
Measurement range	3300microstrain		5000microstrain	10000microstrain	
Resolution	0.5microstrain		1microstrain	2microstrain	
Accuracy	±0.1% FSR				
Non-linearity	±0.5% FSR				

42 VW weldable strain gages

VW weldable strain gage is measuring gages to measure the stress of bridge, building, structure, Model **1220** can measure the stress or strain of the member such as strut, pile. Model **1222** is designed to long gage type product with the length of 250mm. It can measure more exactly when established in the direction of member length(measure of longitudinal strain). Model **1224** is useful if being applied in testing the concrete pile improving steel as manufactured with the structure for high temperature able to be endurable at 200˚C. Model **1220A** is for wide range type.

Model	**1220**	**1222** (long gage)	**1224** (high temp.)	**1220A** (wide range)
Applied sensor	Vibrating wire sensor			
Measurement range	3000microstrain			5000microstrain
Resolution	0.5microstrain			
Accuracy	±0.1% FSR			
Non-linearity	±0.5% FSR			

43 VW embedment strain gages

Model **1240 VW embedment strain gage** is designed to measure strain in reinforced concrete and mass concrete. Short gage length of model **1230** is designed to be useful at tunnel. The model **1230B** is useful for measuring strain toward tangential and radial direction tunnel shotcrete. The model **1235** of subminiature size is usefully used when mock-up tested with the gage of 51.5mm or there is the limit on the condition of establishment. The model **1243** is useful if being applicable in testing the concrete pile improving steel as manufactured with the structure for high temperature able to be endurable at 200˚C. The model **1245** as the gage with 250mm shows the excellent performance more than normal type model since the tension or compression is great big at the prestressed concrete. Model **1240A** is for wide range type.

Model	**1230** (tunnel)	**1230B**	**1235** (mini)	**1240** (standard)	**1243** (high temp.)	**1245** (long gage)	**1240A** (wide range)
Applied sensor	Vibrating wire sensor						
Measurement range	3000microstrain						5000microstrain
Resolution	0.5microstrain						
Accuracy	±0.1% FSR						
Non-linearity	±0.5% FSR						

44 FSG strain gages

Model **4240 FSG embedment strain gage** is designed to measure the effective displacement precisely that operates inside of concrete structure by laying into reinforced concrete or concrete structure. Specially, it is useful for real-time measurement when dynamic measurement is needed for measurement of strain after curing of mass concrete, or for the object of study experiment. Model **4220 FSG surface mount strain gage** measures strain by attaching a bracket to the member.

Model	**4240** (embedment)	**4220** (surface mount)
Applied sensor	FSG sensor (foil strain gage)	
Measurement range	±5000microstrain	
Rating output	1.5mV/V (1500×10^{-6})	
Accuracy	±0.5% FSR	
Resistance	350Ω	

45 VW rebar stressmeters

VW rebar stressmeter is a sensor to measure the stress acting on the deformed rebar of reinforced concrete structures. The diameter of the VW sensor housing is designed in the same shape as the size of the deformed rebar, so accurate measurement is possible. Rebar stressmeter is standard for D25(diameter Φ25.4mm) and D32(diameter Φ31.8mm), which are applied to most basic civil engineering works.

Model	**1265** (D13)	**1260** (D25)	**1290** (D32)
Applied sensor	Vibrating wire sensor		
Measurement range	3000microstrain		
Resolution	0.025% FSR		
Accuracy	±0.1% FSR		
Non-linearity	±0.5% FSR		

46 VW strand strainmeter

VW strand strainmeter is useful for measuring the magnitude, elongation and displacement of the force acting on the strands of an earth anchor, tension and compression anchor.
Before shipment, the VW strand strainmeter is individually calibrated by a digital calibrator for the frequency characteristics compared to the amount of displacement(strain rate). The results will be recorded in the calibration certificate, ensuring quality and reliability.

Model	1315
Applied sensor	Vibrating wire sensor
Frequency range	30000microstrain
Resolution	0.025% FSR (0.01mm)
Accuracy	±0.1% FSR
Non-linearity	±0.5% FSR

47 VW crackmeters

Model **1330 VW crackmeter** is useful for measuring the size change of crack gaps and surface connections of rock or concrete structures. Since there are 4 types of gages with different measuring ranges, they can be selected according to the size of the crack. Model **1322** and **1325** are easy to install as they can be installed using anchors or mounting blocks using quick-setting epoxy. For structures that require precise measurement, it is recommended to use the 1322 with a small measurement range.

Model	1322	1325	1330	1340
Applied sensor	Vibrating wire sensor			
Measurement range	5mm	25mm	50mm	100mm
Resolution	0.025% FSR (0.01mm)			
Accuracy	±0.1% FSR			
Non-linearity	±0.5% FSR			

48 VW waterproof crackmeters

VW waterproof crackmeter is an epoch-marking waterproof product which works at 25bar. It is designed stainless steel so that it can measure displacement at dam site which is close or inside of sea site.

Model	1330W	1340W	1341W	1342W
Applied sensor	Vibrating wire sensor			
Measurement range	50mm	100mm	150mm	200mm
Resolution	0.025% FSR			
Accuracy	±0.1% FSR			
Non-linearity	±0.5% FSR			
Waterproof	250mH_2O (25bar)			

49 VW compression displacement sensors

VW compression displacement sensor is designed to measure displacement of straight.
The spring is applied at end of VW compression displacement sensor and it allows to measure up to 0.01mm at pile load test and crack.

Model	1325C	1330C	1340C
Applied sensor	Vibrating wire sensor		
Measurement range	25mm	50mm	100mm
Resolution	0.025% FSR		
Accuracy	±0.1% FSR		
Non-linearity	±0.5% FSR		

50 FSG crackmeters

FSG crackmeter is composed of sensor part and anchor fixed part. Anchor should be fixed by anchor bolt or grouting in the both ends of crack across the crack. Model **4330, 4331** FSG crackmeter are provided with calibration record by sensors, by digital calibrator it correct electric resistance feature in proportion to displacement. Therefore It guarantees accuracy and reproducibility.

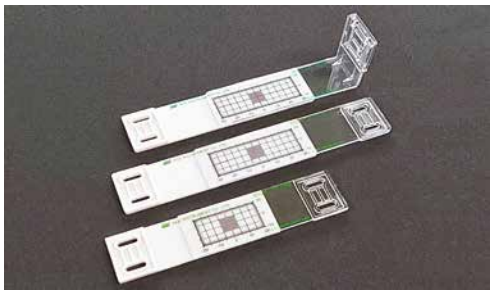
Model	4330	4331
Applied sensor	FSG sensor (foil strain gage)	
Measurement range	5mm, 10mm	25mm
Rating output	6mV/V (6000×10^{-6})	4mV/V (4000×10^{-6})
Accuracy	±0.5% FSR	
Resistance	350Ω	

51 Potentiometric crackmeter

Model **4335 potentiometric crackmeter** is designed with a stainless steel body and a built-in potentiometer. Potentiometric crackmeter is manufactured in two measuring ranges 20mm and 40mm. It has a very precise relationship between displacement and response signal, making it suitable for measuring a crack in structure that require precise measurement.

Model	**4335**
Applied sensor	Linear potentiometer
Measurement range	20mm, 40mm
Rating output	2kΩ, 5kΩ
Resolution	Infinite
Accuracy	±0.3% FSR

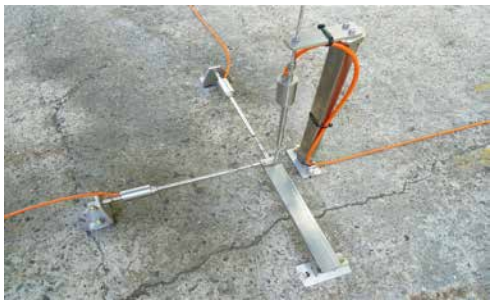
52 Plastic crackmeters



Plastic crackmeter is an inexpensive crack meter that replaces the sensor. It is suitable for use in the field where high-precision measurement management is not required. Plastic crackmeter is used in sites where continuous crack measurement is required such as cracks in old buildings, roads and walls. Two-dimensional crack measurement is possible with 1 set of plastic crackmeter. Other companies' products are easily broken because they are manufactured by molding acrylic. However, our SC-100 is manufactured by molding polycarbonate resin. It is very hard like metal.

Model	**SC-100A**	**SC-100B**	**SC-100C**
Measurement range	±20mm (Left, Right), ±10mm (Up, Down)	±30mm (Left, Right), ±10mm (Up, Down)	±30mm (Left, Right), ±10mm (Up, Down)
Resolution	1mm (grid type)		
Dimensions	32×102×5mm (dual)	32×132×5mm (dual)	32×132×55mm (dual)
Material	Polycarbonate		

53 VW 3D jointmeters



VW 3D jointmenter is for 3 axial and it is useful to measure 3-dimensional structure such as concrete dam joint or crack at tunnel and tank. It is designed stainless steel so that it can use at sea site.

Model	**1330W-3D**	**1340W-3D**	**1341W-3D**	**1342W-3D**
Applied sensor	Vibrating wire sensor			
Measurement range	50mm	100mm	150mm	200mm
Resolution	0.025% FSR			
Accuracy	±0.1% FSR			
Components	Standard mount bracket. sensor bracket, anchor bolt			
Material	STS304, STS316(L) for sea side			

54 Mechanical 3D jointmeters

Mechanical 3D jointmeter is measuring kit for 3 axial and it is useful to measure 3-dimensional structure such as dam site by dial gage.

Model	**6310**		
Measurement range	±12.5mm	±25mm	±50mm
Resolution	0.01mm		
Material	Stainless steel		

55 VW jointmeters

Model **1310 VW surface mount jointmeter** can easily measure the joints of concrete dams, tunnels, tanks, bridge piers, joints of abutments, crack size and progression of structures using mounting brackets. It is designed with a durable structure. Model **1320 VW embedment jointmeter** is used with embedment accessories. It can be installed on the inner joints of concrete structures such as dams, embankment foundations, and bridges to measure the magnitude and speed of displacement. Model 1310 is divided into uniaxial and triaxial. This sensor consists of a main body, mounting bracket and anchor kit which are accessories for installation. Model 1320 consists a body for installation inside concrete, a sensor socket and a target which are accessories for installation.

Model	**1310** (surface mount type)	**1320** (embedment type)
Applied sensor	Vibrating wire sensor	
Measurement range	50 ~ 200mm	
Resolution	0.01 ~ 0.04mm	
Accuracy	±0.1% FSR	
Non-linearity	±0.5% FSR	

56 Electrical jointmeter

Electrical jointmeter measures the magnitude and trend of displacement in dams, bridge piers and abutments. For accurate measurement, this model uses high-accurate potentiometer and it shows voltage(mV) under every different displacement by working site.

Model	4315
Applied sensor	Linear Potentiometer
Measurement range	25 ~ 150mm
Resolution	Infinite
Accuracy	±0.1% FSR
Non-linearity	±0.5% FSR

57 VW soil strainmeters

Model **1360 VW soil strainmeter** can measure the size, ratio, and tendency of the underground displacement acting on the slope due to freshwater pressure by embedding multiple stations for each station at various measuring points of the embankment dam. Underground displacement can be measured at embankment or road embankment.

Model	1360
Applied sensor	Vibrating wire sensor
Measurement range	150mm, 300mm
Resolution	0.025% FSR
Accuracy	±0.1% FSR
Non-linearity	±0.5% FSR

58 Long range crackmeter

[500, 1000mm] [2000, 3000mm]

Long range crackmeter has wire to rotary potentiometer that can measure maximum 3m. It can measure displacement that can occur greatly in wall of apartment as its wall cutted off precisely.

Model	5900
Applied sensor	Rotary potentiometer
Measurement range	0.5, 1, 2, 3m
Rating output	1kΩ
Resolution	Infinite
Accuracy	±0.1% FSR
Non-linearity	±0.5% FSR

59 VW settlement gage

VW settlement gage that have VW sensor can measure settlement or heave of construction site. VW settlement gage is consisted of liquid reservoir kit, tube that liquid fills and VW pressure sensor and automation measure is available and long distance transmission of output signal is available.

Model	1810
Applied sensor	Vibrating wire sensor
Measurement range	7 ~ 20m difference of phase (0.7 ~ 2kg/cm^2)
Resolution	0.5 ~ 4.0mm
Accuracy	±0.1% FSR
Non-linearity	±0.5% FSR

60 High sensitivity settlement systems

Model **1680 VW high sensitivity settlement system** can precisely measure the finest deflections of abutments or piers. It consists of a reference vessel and a monitoring vessel.
The model 1680 VW high sensitivity settlement system has a wide measurement range compared to the electric system and allows semi-permanent measurement.
The model **5680 ultrasonic system** uses ultrasonic waves to measure micro-displacement in non-contact manner.

Model	1680	5680
Applied sensor	Vibrating wire sensor	Ultrasonic sensor
Measurement range	100mm, 300mm, 600mm	100mm(optional 200mm)
Resolution	0.025% FSR	0.01mm
Accuracy	±0.1% FSR	
Non-linearity	±0.5% FSR	

61 Settlement profiler

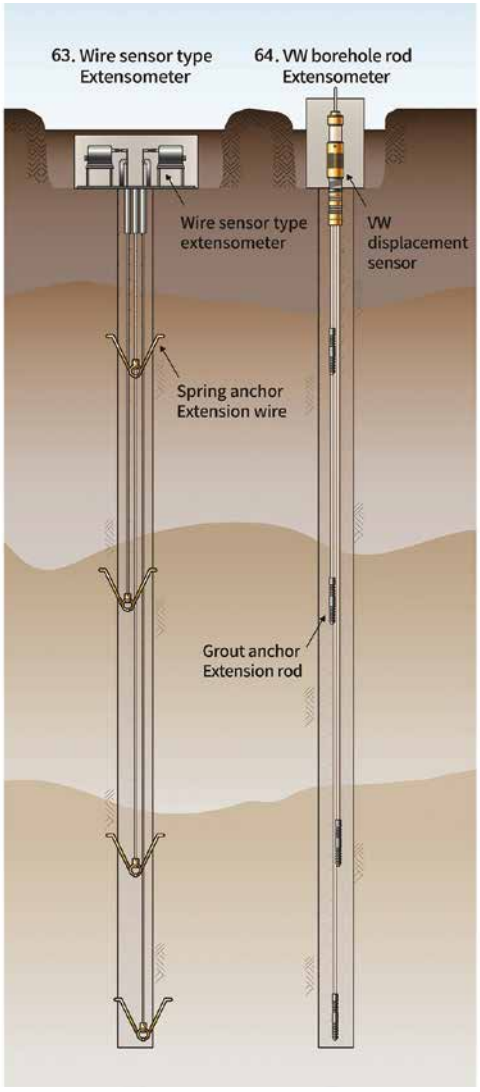
Settlement profiler can measure the settlement and heave at bank, LPG or LNG tank, road, etc. There is a semiconductor sensor inside of probe and liquid tube is coiled at reel.

Model	**5200**
Applied sensor	Semiconductor pressure sensor
Measurement range	10m
Resolution	0.01% FSR
Accuracy	±0.1% FSR
Dimensions	Φ35×200mm (probe) / Φ600×200mm (wheel)

62 Magnetic sensors

Sensing rings of magnetic extensometer is used to measure settlement or heave in fills, foundations and dams. Magnetic extensometer consists of sensing rings, a magnetic indicator, an access pipe, telescopic sections and an end is anchored in stable ground, the depth of each sensing ring is referenced to a datum ring that is fixed to the bottom of the access pipe. The sensing rings include plate rings, spider rings and datum ring.

Model			**4680P**	**4680C**
Sensing ring	Datum ring	To install at stable ground	for O.D Φ38mm ABS, PVC pipe (Φ26 ~ Φ64mm O.D optional)	for O.D Φ70mm,Φ85mm inclinometer casings
	Spider ring	To install several pieces at each stratum		
	Plate ring	To install at embankment		



63 Wire sensor type extensometer

Wire sensor type extensometer is consisted of wire displacement sensor for installation point, grouting anchor at foundation rock inside of borehole for fixing. It is also consist of stainless wire; and protective tube for connecting between wire displacement sensor and grouting anchor.
Wire sensor has rotary potentiometer inside for high precision. It is optimized to measure accurate data and wide range(3000mm).

Model	**4750**
Applied sensor	Rotary potentiometer
Measurement range	500 ~ 3000mm
Resolution	Infinite
Accuracy	±0.1% FSR
Non-linearity	±0.5% FSR

64 VW borehole rod extensometer / MPBX

Model **1380 VW borehole rod extensometer** is designed to measure the displacement of each stratum due to the settlement of boreholes or elevations by 1~6 measuring anchors at the reference point of the ground.
It is composed of anchor, rod, protection tube and sensor part. The sensor part is equipped with a precise VW displacement sensor. There are two types of VW extensomter, 50mm and 100mm, so it can be selected according to the size of the expected displacement. Unmanned automated measurement and long-distance transmission of output signals are possible.

Model	**1380**
Applied sensor	Vibrating wire sensor
Measurement range	50mm, 100mm
Resolution	0.025% FSR
Accuracy	±0.1% FSR
Non-linearity	±0.5% FSR
Measuring point	Standard : 1~6 points

65 VW weir monitoring system

VW weir monitoring system employs a VW force transducer and is sensitive to water level. This consists of the VW transducer, a cylindrical buoy. assembly to detect water level, and a chamber to inject water. Water level in a chamber serves as buoyancy that is equal to adjacent water level.
When using it under weir monitoring system on the dam site, you have to apply them to accessories on V notch, wave filter and discharge weir. Then the size or installing place has to be consulted beforehand.

Model	**1650**
Applied sensor	Vibrating wire sensor
Measurement range	300mm , 600mm, 1500mm
Resolution	0.025% FSR
Accuracy	±0.1% FSR
Non-linearity	±0.5% FSR

66 USBR type settlement probe

USBR settlement probe is designed to measure ground settlement and heave. Also, it is useful for accuracy elevation of inclinometer data.

Model	**5010SP**
Applied range	Inclinometer casing (ID : Φ50 ~ Φ73mm) which is applied telescopic section
Weight	3.3kg
Dimensions	Φ40×600mm

67 VW piezometers

VW piezometers are designed to measure pore water and fluid pressure.
Model **1510** VW piezometer is designed to be embedded in earth fills and at concrete interfaces or inserted into boreholes and small diameter pipes. Model **1515** is designed for low pressure and Model **1500S** and **1500US** are for subminiature. Model **1520** available for pushing directly into soft ground. Model **1530** is designed to measure fluid pressure in pipelines for industrial and hydraulic. And it is useful to measure upstream pressure in a hydroelectric power plant. Model **1540** available for heavy duty. This model is specially manufactured to use in the site where semi permanent measurement is necessary like dam site.
Model **1545** is equipped with a ring type large metal filter. The ring type filter has a very wide contact surface and can be used for all part such as seawater, sand layer, sediment layer, mineral layer. It can use as water level sensor as well.
Model **1550** is designed with titanium material that has excellent corrosion resistance and chemical resistance so that it can be used in harsh environments.

Model	**1510** (standard)	**1515** (low pressure)	**1520** (push in)	**1530** (pressure sensor)	**1540** (heavy duty)	**1545** (ring filter)	**1500S** (slim size)	**1500US** (ultra slim)	**1500** (corrosion resistance)
Applied sensor	Vibrating wire sensor								
Measurement range	2 ~ 70kg/cm^2 (0.2 ~ 7.0MPa)								
Resolution	0.025% FSR								
Accuracy	±0.1% FSR								
Non-linearity	±0.5% FSR								

68 VW mult-point piezometer

VW multi-point piezometer can measure drilling hole internal stratification pore water pressure because it consisted of 1510 VW piezometer and PVC extension tube, housing to attach piezometer. This product can cope water leakage problem that appears when installing several piezometer to 1 drilling hole.

Model	**1500**
Applied sensor	Vibrating wire sensor
Measurement range	2 ~ 70kg/cm^2 (0.2 ~ 7.0MPa)
Resolution	0.025% FSR
Accuracy	±0.1% FSR
Non-linearity	±0.5% FSR

69 VW vented piezometer

VW vented piezometer is useful at detailed survey time that barometric pressure revision unnecessary and thin having barometric pressure tube to signal cable. This product is useful to water level measurement of lake and river.

Model	**1560**
Applied sensor	Vibrating wire sensor
Measurement range	2 ~ 70kg/cm^2 (0.2 ~ 7.0MPa)
Resolution	0.025% FSR
Accuracy	±0.1% FSR
Non-linearity	±0.5% FSR

70 FSG piezometer

FSG piezometer is designed to measure pressure vessel or pipeline, embankment and pore water pressure and so on.
Specially, dynamic measure suitable in study purpose or spot that need real-time measure.
FSG piezometer is designed to lay under the ground directly on embankment or foundation.

Model	**4510**
Applied sensor	FSG sensor (foil strain gage)
Measurement range	2 ~ 35kg/cm^2 (0.2 ~ 3.5MPa)
Rating output	1mV/V (1000×10^{-6})
Accuracy	±0.5% FSR
Resistance	350Ω

71 Semiconductor piezometer

Semiconductor piezometer is designed to measure pressure vessel or pipeline, embankment and pore water pressure and so on.
Specially, dynamic measure suitable in study purpose or spot that need real-time measure.
Semiconductor piezometer is very useful measure to low pressure.

Model	**4515**
Applied sensor	Semiconductor pressure sensor
Measurement range	1 ~ 20kg/cm^2 (0.1 ~ 2.0MPa)
Rating output	4 ~ 20mA 2wire or 1 ~ 5V
Accuracy	±0.5% FSR

72 Pneumatic piezometer & readout unit

Pneumatic piezometer is a mechanical piezometer. Measure by reading the offset pressure balance of the nitrogen gas pressure and water pressure emitted from the pneumatic sensor indicator. It is high reliability with excellent accuracy but supplied in low price. It is designed to measure the water pressure and pore water pressure about borehole, foundation, embankment.
Model **ACE-2500 pneumatic readout unit** is designed for easy connection to pneumatic sensors via a one-touch coupler. It supplies nitrogen gas to accurately measure pressure applied to the sensor up to 20bar, providing reliable data.

Model	**2510** (piezometer)	**ACE-2500** (readout unit)
Applied sensor	Pneumatic sensor	-
Measurement range	0 ~ 15kg/cm^2	0 ~ 20bar (0 ~ 2kPa)
Resolution	0.001kg/cm^2	0.02bar (2kPa)
Accuracy	±0.5% FSR	±0.1% FSR

73 Lab. instruments

Model **4530 miniature piezomter** and model **4950 miniature earth pressure cell** are very useful products when model experiments are required in civil engineering departments of universities or national research institutes.
These product have a built-in electric sensor with a foil strain gage attached and high accuracy, high reliability and is waterproof and anticorrosive. The dynamic measurement and long-distance transmission are available.

Model	**4530** (miniature piezometer)	**4950** (miniature earth pressure cell)
Applied sensor	FSG sensor (foil strain gage)	
Measurement range	1 ~ 10kg/cm^2 (0.1 ~ 1.0MPa)	
Rating output	1mV/V (1000×10^{-6})	
Accuracy	±0.5% FSR	
Resistance	350Ω	

74 Standpipe piezometer

Standpipe piezometer is useful to receive precious data instead of using electrical transducer. It consists of a reel frame with a buzzer and a light, a graduated 50m~500m tapes and a probe. For use this to piezometer, after the filter tip and standpipe are installed borehole, it should be covered the around filter tip with sand. The top of the filter zone is sealed with bentonite to isolates the pore water at the tip. The upper bentonite zone is back filled to the surface with a bentonite grout to prevent vertical migration of water.

Model		4650
Water level meter	Range	50 ~ 500m
	Tape resolution	1mm
	Weight	2.5 ~ 15kg
Filter tip	Density / Material	50μm / PE or ceramic filter
	Dimensions	Φ39×365mm (PE), Φ39×350mm (ceramic)

75 VW earth pressure cells

VW earth pressure cell is used to verify the excessive pressure of the structure or design assumptions. Model **1910(standard)** is used to measure the total pressure applied to the dike, embankment, alternation of buildings, bridges and sheet piles. It is very useful to install 3~5 sets in one group in a dam or embankment. Model **1920(jack out)** is designed to measure the total pressure acting on a retaining wall or slurry wall. This sensor must be used with a hydraulic jack, a pressure plate and a reaction plate. Model **1930(built-in strain gage)** has a VW strain gage built into the cell and is useful for tunnel lining or model experiments at an affordable price. Model **1940(push in)** is designed in a long and thin shape to measure the lateral pressure of the hole or to be mounted at the boring drill for soil testing. Model **1913(non-direction)** is designed of sensitive side on both the upper and lower plate of the cell, so it can be installed without distinction between the upper and lower parts. It is installed inside the fill layer or concrete to measure the pressure acting on it.

Model	1910 (standard)	1911 (slim)	1920 1921 (jack out)	1940 (push in)	1913 (non-direction)	1930 (VW strain gage)
Applied sensor	Vibrating wire sensor					
Measurement range	2 ~ 70kg/cm² (0.2 ~ 7.0MPa)					20kg/cm² (2.0MPa)
Resolution	0.025% FSR					
Accuracy	±0.1% FSR					±0.5% FSR
Non-linearity	±0.5% FSR					±1.0% FSR

76 Temperature gages

Model **1010 VW temperature gage** consists of the stainless steel transducer body to which a VW sensor element is attached.
The frequency signal from VW temperature gage is very stable and accurate. Automatic measuring is possible. Moreover, VW temperature gage is possible to measuring in semi-permanent, and it is manufactured in the structure of waterproof.
Model **5550T thermistor probe** is the temperature gage that thermistor is built in it, it is useful for measuring the long range of temperature, and short period.

Model	1010	5550T
Applied sensor	Vibrating wire sensor	Thermistor
Measurement range	−40 ~ 150℃	−40 ~ 120℃
Resolution	0.03℃	0.1℃
Accuracy	±0.5℃	±1.0℃

77 Rock bolt pull tester set

Model **7200 rockbolt pull tester set** is a portable product operated to verify the eligibility and effectiveness of rock bolts installed to reinforce rock mass in tunnels or slopes. It is useful for judging the proper length of the rock bolt and determining the fixing method and type of the rock bolt. Model **7201 digital rebar pull tester set** is used to verify the fixing power and effectiveness of the constructed rebar. You can easily check the load applied to the reinforcing bar with digital numbers in tons.

Model	7200	7201
Portable pump	Max. pressure : 700bar / Weight : 10.9kg	
Pressure meter, Indicator	Analog sensor, 700bar (34ton)	Digital sensor, 700bar (60ton)
Hydraulic hose	Sheath : neoprene rubber / Dimensions : Φ13×15mm	
Cylinder (RAM)	Portable / Hollowness type Stroke : 50mm	Portable / Hollowness type Stroke : 50mm
Magnetic stand & gage	Dial gauge / Resolution : 0.01mm (Optional : Digital gauge)	

78 Tunnel convergence monitoring system

ACE-TCS tunnel convergence monitoring system is used for detecting the size and direction of the deformed cutting plane in tunnel or underground structure. For a single track tunnel, 8~10 displacement sensors and tilt sensors are installed; for a double track tunnel, 14~16 are installed along the tunnel wall. ACE-TCS has vibrating wire displacement sensor and MEMS tilt sensor built in. It can easily be installed, enduring the measured data with high precision. When the analysis program 'TCS-PRO' is used, 2D graphics are displayed in the unit of 0.01mm.

Model	**ACE-TCS**	
Applied sensor	VW displacement sensor	MEMS tilt sensor
Measurement range	20mm	±5°
Resolution	0.005mm	5arc seconds
Accuracy	±0.1% FSR	
Non-linearity	±0.5% FSR	

79 Rail track monitoring system

ACE-RTM rail track monitoring system can accurately measure the settlement or twist of the rail on the railroad. Rail track monitoring system can easily measure the size or tendency of the settlement and twist of the rail when urban construction is underway adjacent to the railroad, underground passageway, or subway tunnel construction is underway. The sensor is built into a waterproofed stainless tube and is connected to the joint and the protective tube with a serial communication one-line cable. It is very easy to install in the field as it comes pre-assembled with multiple points of sensors.

Model	**ACE-RTM-U** (uniaxial)	**ACE-RTM-B** (biaxial)
Applied sensor	MEMS sensor	
Measurement range	±10°	
Resolution	10arc seconds	
Accuracy	±0.1% FSR	
Non-linearity	±0.5% FSR	
Communication method	Serial communication (One-line)	

80 VW convergence meters

Model **1345 VW convergence meter** is mainly used to figure any changes in size, ratio and tendency of tunnel, caused by constructing tunnels or underground structures. Convergence meter is composed of sensor part, stainless steel extension rod and hook. It is a precise instrument, which measure inner section between 2 points by placing hooks at both sides' ends.
Model **1347** uses carbon fiber wire to connect the sensor part and fixed point. Carbon fiber wire has very little temperature change and is light, so it is very useful even for long distance.

Model	**1345**	**1347**
Applied sensor	Vibrating wire sensor	
Measurement range	50mm, 100mm	
Resolution	0.025% FSR	
Accuracy	±0.1% FSR	
Non-linearity	±0.5% FSR	

81 Digital tape extensometer

Digital tape extensomter is a measuring instrument that measures small relative displacement by connecting two points with steel tape. It is useful to measure the size of deformation when excavating underground space. It consists of a steel tape and a high-precision digital gauge in the housing, a tension adjustment sleeve, and a moving hook that can move during tension adjustment. It is made with a slider cover for easy on/off.

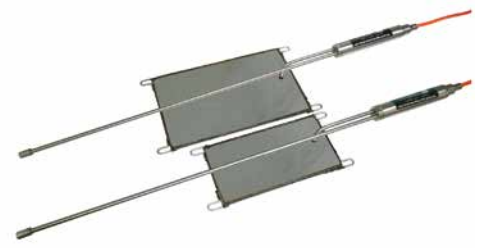
Model	**2350D**
Applied sensor	Digital gauge (Mitutoyo's, Japan)
Measurement range	Standard 20m, Optional 30m
Resolution	0.01mm
Accuracy	±0.1mm

82 Geodetic targets

Model **7500 reflection target** is a total station for civil engineering works such as tunnel or excavating underground. There are a triple prism and reflection target for a light wave target. It uses high brightness for displacement and thus its accuracy is lower than triple prism and its range of force is up to 100m. As it allows for 2-dimensional measurement, it is very handy for civil engineering works such as tunnel; and its price is very low compared to prism.
Model **7510 prism target** has high brightness because of using reflection of light and its range of force is up to 500m. Also, it is possible to use for 3-dimensional measurement.

Model	**7500** (reflection target)	**7510** (prism target)
Accuracy	Angle ±0.5mgon, distance ±1.2mm	Angle ±0.3mgon, distance ±1.0mm
Weight	0.1kg	0.2kg
Material	Polyamide + G.F 30%	
Target grade	High bright reflection sheet	Crystal prism

83 VW NATM shotcrete stress cells



VW NATM shotcrete stress cells are designed according to NATM recommended method to measure radial and tangential stresses of tunnel shotcrete lining. This sensor is often combined with a tape extensometer, VW rod extensomter, and VW rockbolt stressmeter to measure the magnitude and direction of force acting on the lining, and is useful for determining the thickness of the lining and the timing of the secondary pour.

Model	1270	1280
Applied sensor	Vibrating wire sensor	
Application	Tangential cell	Radial cell
Measurement range	70, 200kg/cm² (7, 20MPa)	30, 50kg/cm² (3, 5MPa)
Resolution	0.025% FSR	
Accuracy	±0.1% FSR	
Non-linearity	±0.5% FSR	

84 Mechanical extensometers

Mechanical extensometer is measured by using a depth gauge. Model 2390 is shipped assembled at the factory to measure 6m. In case of Model 2391A, since the anchor rod is made of fiberglass, it will be shipped after we roll it up. It is useful for excavation work in tunnels, mines, communication ports, common areas and underground spaces.

Model	2390	2391A	2391B
Measuring method	Dial depth gauge		
Measuring point	4P	1 ~ 4P	1 ~ 6P
Measurement range	50mm(standard), 100mm(Optional)		
Full length	2 ~ 6m	Over 7m	

85 VW rod extensometers / MPBX

VW rod extensometer is useful for measuring the displacement of the surrounding ground due to convergence, the deformation of the slope, and the vertical and horizontal displacement of soil or rock in the tunnel when excavating underground spaces such as tunnels, mines, hangars, communication ports and common areas.
Model **1390** VW rod extensometer consists of a built-in sensor part and anchor rod with 4 small VW displacement sensors waterproof and moisture-proof.
Model 1390's anchor length is divided into 2~6m length, so it can be selected according to the design specified length or construction site situation. Model **1391** is designed to be assembled and installed in the field with an anchor of 7m or more.

Model	1390 (standard)	1391 (ass'y on site)
Applied sensor	Vibrating wire sensor	
Measurement range	50mm, 100mm, 200mm	
Resolution	0.025% FSR	
Accuracy	±0.1% FSR	
Non-linearity	±0.5% FSR	

86 VW rock bolt stressmeter

Model **1350 VW rock bolt stressmeter** is used to verify validity such as effective length, quantity and stress of rock bolts. It is also equipped with four VW strain gages, each other equally spaced in the rock bolt, and is waterproof and anticorrosive.
VW rock bolt stressmeter employs typically four measuring points that is equivalent to layers.

Model	1350
Applied sensor	Vibrating wire sensor
Measurement range	3300microstrain
Resolution	0.5microstrain
Accuracy	±0.1% FSR
Non-linearity	±0.5% FSR

87 VW borehole rock stressmeters

Model **1338 VW borehole rock stressmeter** is a rock stressmeter using a vibrating wire sensor to measure the deformation of an excavation hole. It is designed to measure the change in stress of rock mass in tunnels and mines for a long time.

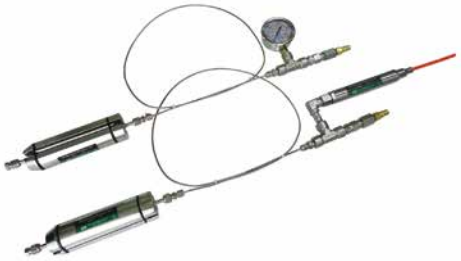
Model	1338EX	1338BX	1338NX
Applied sensor	Vibrating wire sensor		
Borehole diameter	Φ37 ~ Φ39mm	Φ58 ~ Φ61mm	Φ74 ~ Φ77mm
Measurement range	700kg/cm² (70MPa) compression / 30kg/cm² (3MPa) tension		
Resolution	0.014 ~ 0.07kg/cm² (1.4 ~ 7.0kPa)		
Accuracy	±0.1% FSR		

88 VW soft inclusion stress cells

VW softe inclusion stress cell(SISC) can be installed in HQ, PQ, and 6-inch large diameter diamond boreholes. Model 1370 consists of a body part with a built-in vibrating wire, coil in a round-circular housing, a wedge part for applying a load, and a bearing plate for receiving a load. This product must apply the modulus of elasticity of the rock mass previously sampled.
It has built-in high-accuracy resistance temperature sensor to compensate for the coefficient of linear expansion of the gage due to temperature change, and is waterproof and rust-proof. Thus it's semi-permanent measurement is possible.

Model	1370HQ	1370PQ	1370H	1370M
Applied sensor	Vibrating wire sensor			
Borehole diameter	Φ93mm HQ	Φ123mm PQ	Φ152mm (6inch)	Φ152mm (6inch)
Installation method	Hydraulic type			Torque wrench type
Measurement range	±350kg/cm² (±35MPa)			
Accuracy	±0.1% FSR			

89 VW borehole pressure cell



VW borehole pressure cell is designed for high-accuracy measurement of rock stress. This product is usefully used in rock structures such as mines, nuclear defense plants and hydroelectric power plants, During operation, the initial load must be applied by the hydraulic system after the cell part is inserted into the hole.

Model	1339	1339A
Applied sensor	Vvibrating wire sensor	Bourdon pressuremeter
Measurement range	200, 300, 700kg/cm² (20, 35, 70MPa)	
Resolution	0.25% FSR	0.5% FSR
Accuracy	±0.1% FSR	±0.5% FSR
Non-linearity	±0.5% FSR	±1.0% FSR

90 VW biaxial stressmeter

Model **1375 VW biaxial stressmeter** is designed to measure the change of the rock(BX drill hole-Φ60mm) stress. VW biaxial stressmeter has 3nos VW strain gages in the direction 60°, so you can know direction and size of rock stress. Model **1375L** is applied to the standard model 1375 by adding a longitudinal strain gage. It is designed to measure the biaxial stress in the borehole and to measure the longitudinal strain in the borehole direction.

Model	1375	1375L
Applied sensor	3-Vibrating wire sensor	4-Vibrating wire sensor
Measurement range	700kg/cm² (70MPa), longitudinal 3300microstrain	
Resolution	0.014 ~ 0.07kg/cm² (1.4 ~ 7.0kPa), longitudinal 0.5microstrain	
Accuracy	±0.1% FSR	
Non-linearity	±0.5% FSR	

91 2D borehole deformation gage

2D borehole deformation gage is an equipment that measure stress of base rock at overcoring of base rock as in-situ test equipment. If is pressed down within hole because plunger that can detect base rock strain or 3 directions to model 4338 install after the first EX drill hole and transfers by out device. Model 4338 is designed so that fine setting may be available in base rock boring in tunnel, nuclear plant construction, hydroelectric power plant construction etc.

Model	4338
Applied sensor	FSG sensor (foil strain gage)
Borehole diameter	Φ38mm(EX diamond drill)
Resolution	0.1microstrain
Overcoring depth	Min 1.0m ~ max 15m
Accuracy	±0.5% FSR

92 3D rock borehole deformation gage & logger

3D rock borehole deformation gage & logger use overcoring technique to measure the deformation modulus of rock.
This equipment is commercialized for the first time in the world with the use of the patent of researchers of Korea Institute of Geoscience and Mineral Resources.
The product consists of the sensor part with built-in 4-rosette type strain gage and epoxy actuator at the time of overcoring and the logger part with data logger and compressed air tank, ensuring high reliability, high precision, and engineering-friendliness. The cutting-edge equipment supports the separation of the data logger after test and the installation to PC program for analysis.
The sensor part is disposed of after one-time use. The data logger is collected together with installation tools, and can be used almost semi-permanently. With the use of PC program, it is possible to check the analysis results easily.

Model	**4336P** (sensor part)	**4336D** (logger part)
Applied sensor	3D-FSG sensor	3D-FSG sensor Reading, storage
Resistance	120Ω	
Accuracy	±0.5% FSR	
Borehole diameter	Φ38mm(EX diamond drill)	
Overcoring depth	Min 1.0m ~ max 15m	
Material	Stainless steel	

93 Rock borehole pressuremeter

GJ-75 rock borehole pressuremeter is attached sliding platen of jack to measure the contraction and expansion for the displacement of borehole wall pressured by a hollow wall.
This jack is located in appointed location of hole connected such as drill rod of NX boring machine for hydraulic lines and signal cable.
When applied hydraulic to manual hand pump, the jack's bearing plate will expansion and the borehole will attached to borehole wall.
Jack has 2 LVDT to measure the displacement deviation of rock. Data logger(GJ-75D) is connected the sensor of signal cable and it is data reading and saving.

Model	**GJ-75H** (hard rock)	**GJ-75S** (soft rock)
Applied sensor	LVDT(2.5mm) 2 nos	
Piston quantity	12 nos	3 nos
Borehole diameter	Φ70 ~ Φ85mm	
Components	Data logger : GJ-75D Hand pump : GJ-75P Hydraulic hose : 15m	Soft rock jack Hard rock jack Signal cable : 15m

94 Borehole pressuremeter

PMT-75 borehole pressuremeter(PMT) is the lateral load testing equipment of borehole whose pressure capacity is 20MPa. This equipment targets hard soil layers that can't be measured with the LLT test equipment and can measure from soft ground to hard ground(weathered rock layer). Data logger(PMT-75D) is connected the sensor of signal cable and it is data reading and saving.

Model	**PMT-75**	
Borehole diameter	Φ72 ~ Φ92mm (20mm)	
Applied sensor	Measuring displacement of diameter : LVDT Measuring inside of water pressure : pressure sensor	
Components	Data logger : PMT-75D Pressuremeter probe : PMT-75 Hand pump : PMT-75P	Hydraulic hose Signal cable Testing jig

95 Borehole shear tester

BST-75D borehole shear tester is designed for measuring shear resistance at Φ75mm size of borehole inside so that it can provide adhesive power and frictional angle. It is possible to take a test at several point located inside of borehole.
During measurement, the data is stored in the digital data logger(**BST-75D**), which automatically analyzes and displays the adhesive power and frictional angle.

Model	**BST-75D**	
Test standard	Φ70×52mm / Max. pressure : 1.0MPa	
Max. authorized pressure	1.0MPa	
Components	Digital data logger Tester head set Extension rod	Air hose Foot pump

96 Digital hydraulic calibrator set

HC-15S digital hydraulic calibrator set is a self-calibrating device for calibrating or verifying a piezometer. It combines a hand pump set, a dedicated clamp holder manufactured differently for each model and a digital pressure gauge.
The pressure applied from the pump is directly displayed on the digital pressure sensor, allowing for easy and accurate calibration.

Model	**HC-15S**
Applied sensor	Digital pressure sensor
Pressure range	0.001 ~ 5MPa
Accuracy	±0.25% FSR
Resolution	0.001MPa
Dimensions	527×324×350mm
Weight	10kg

97 Portable spot welder

ACE-1200 portable spot welder is designed to use the VW spot weldable strain gage more conveniently on the site. It charges with electricity 100% by SCR condenser. It also offers you highly precise and qualified welding effect. As its welding time is short, the deformation by heat and deformation of welding electrode are minimal. Therefore, it is easy as even beginners can work with less restriction on welding and working condition. Also, it is designed as a compact size to maximize its portability.

Model	**ACE - 1200**
Input	220VAC / 4.5kVA
Welding capacity	Max. 0.8t
Controller	SCR condenser
Dimensions	320×190×190mm
Weight	25kg

98 Sealing kits

When connecting the signal cables to extend, the **Sealing kit** is a product that makes the connecting part being connected even better than the original state of signal cables.
Sealing kits are prepared in wide variety from Φ3~Φ12mm.

Model	**K - A, B, C**		
Size of applied cable	A type : Φ3 ~ Φ7mm	B type : Φ5 ~ Φ10mm	C type : Φ8 ~ Φ14mm
Material	PVC & PE		
Using epoxy	Rapid epoxy for liquid type		

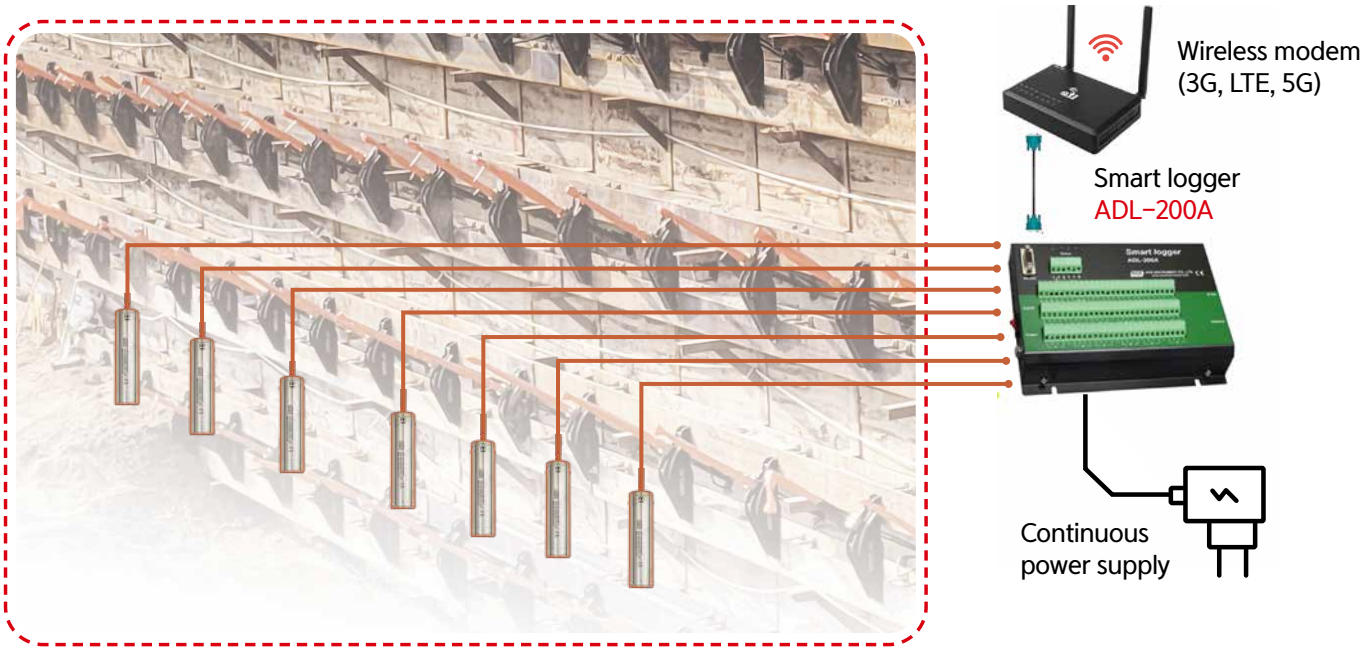
99 Signal cables

Signal cables are made to various quality of the material and diameter to apply in engineering works spot. It can use usefully at base rock or concrete laying because is insulated with excellent biographical special quality and waterproofed.

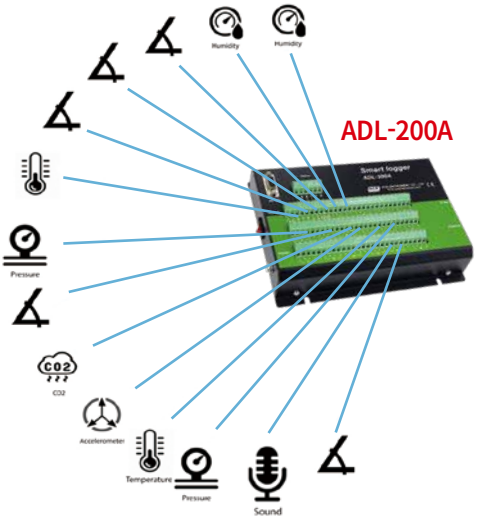
Model	Use	Application site
PVC cable	Standard	On site that which have pollution
PVC shielded cable	Standard	Connect to electrical sensor at noise environment
PU cable	Standard	On site that which have pollution
Silicone cable	High temp.	Make concrete pile of high temp.
Aramid fiber reinforced PU cable	Heavy duty	Dam site(big displacement) or demand the durability

Smart Logger-based measurement systems are:

Offline measurement systems, Advantageous for deploying numerous sensors in a small area



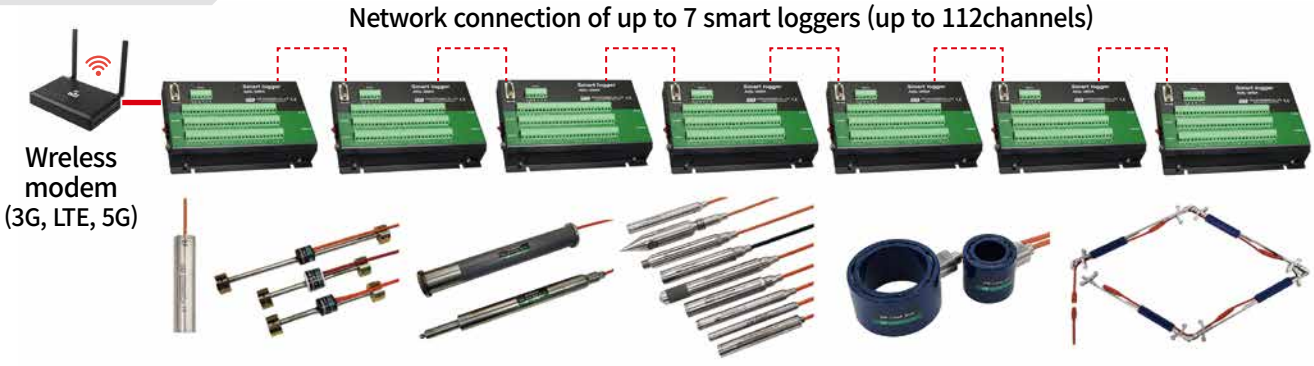
Wired connection between sensors ⟷ smart loggers



- Smart Logger-based measurement system
- Measures mV sensors, VW sensors, FSG sensors and temperature sensors
- 16 input channels per ADL-200A
- Network configuration of up to 7 of ADL-200A(up to 112 channels)
- Data stored in smart loggers in transmitted to the main server via offline, telecommunication or wireless communication
- Measurememt data is collected as regular intervals (no real-time support).
- Sensors and smart loggers are connected via individual wiring.
- Sensors can be installed equal to the number of input channels on the smart logger.
- Advantageous for deploying numberous sensors in a small area.
- Suitable for operation in areas with continuous power supply

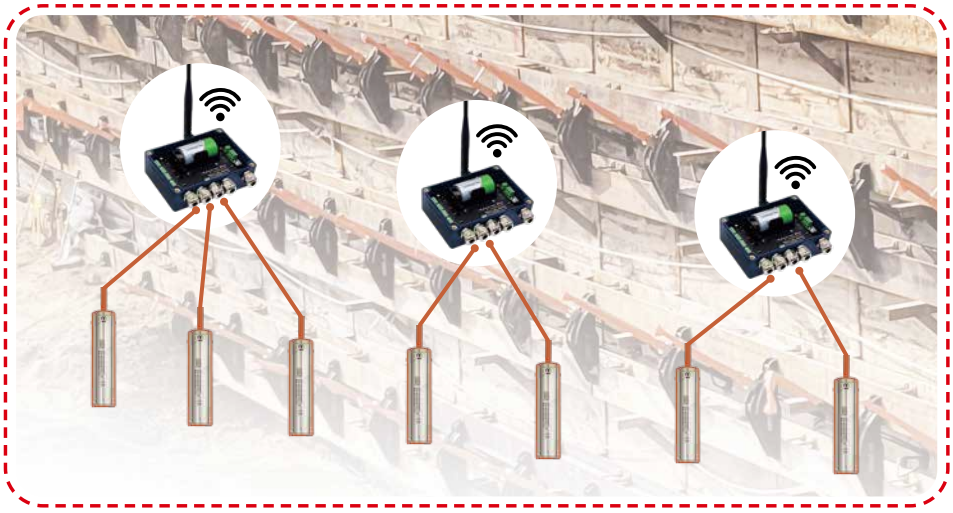
Application examples

Network connection of up to 7 smart loggers (up to 112channels)

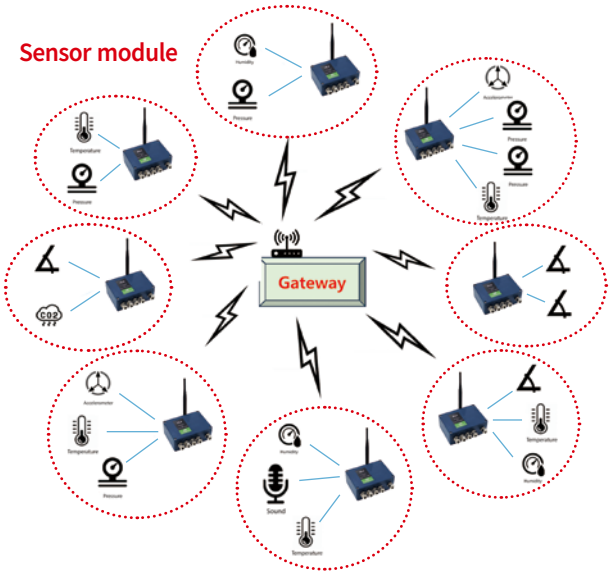


Smart LoRa-based wireless measurement systems are:

LoRa communication wireless measurement system, Advantageous for sites with numerous sensors distributed in small groups over a wide area



Wireless connection between sensor module ⟷ gateway



- LoRa communication-based wireless measurement system
- Real-time measurement data is transmitted to a server, enabling rapid action and monitoring.
- Measures mV sensors, VW sensors, FSG sensors and temperature sensors.
- A variety of sensor modules with 1 to 4 channel configurations are available for selection.
- Suitable for sites with a small number of sensors distributed across a small number of locations.
- Easy installation via LoRa wireless communication between sensor modules ⟷ gateway.
- Wireless communication up to 6km between sensor modules ⟷ gateway eliminates the need for complex and lengthy wiring.
- Easy expansion when installing additional sensors in existing sites.
- Battery-based measurement systems allow for flexible installation and operation even in areas without continuous power supply.
- Up to 233 sensor modules can be connected to a single gateway.
- For sites with a large number of sensors, multiple gateways can be installed to support large-scale sensor operation.

Application examples

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