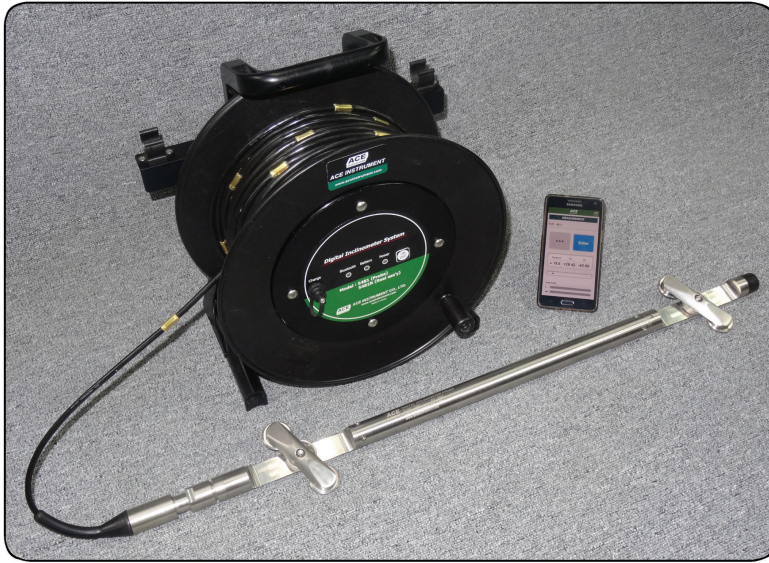


Digital vertical inclinometer system

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Applications

Digital vertical inclinometer system is used to survey the horizontal displacement from inside of casing.

It is used to monitor subsurface deformations of the ground in landslides, embankments, and dams and around deep excavations and tunnels.

Description

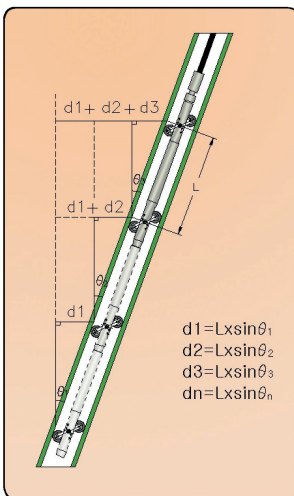
Digital vertical inclinometer system has pursued a development by concentrating on high-performance nature such as responsiveness, ultra-light and high-reliability.

Digital vertical inclinometer system includes a lightweight digital inclinometer probe, Bluetooth reel, cable guide and the software as "Inclinometer Collector" for Android-based device.

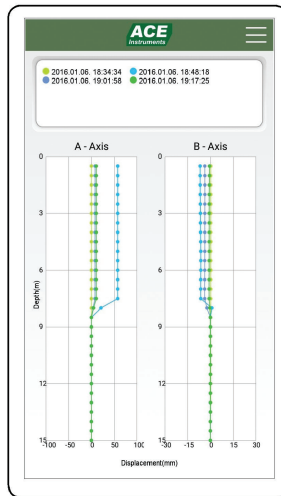
In case of installed inclinometer casing at zone of suspected displacement in a vertical borehole, it is possible to acquire the data to smart device through digital inclinometer system.

The data that was acquired at smart device can be transferred to PC by e-mail and it is operated by Geopro software program.

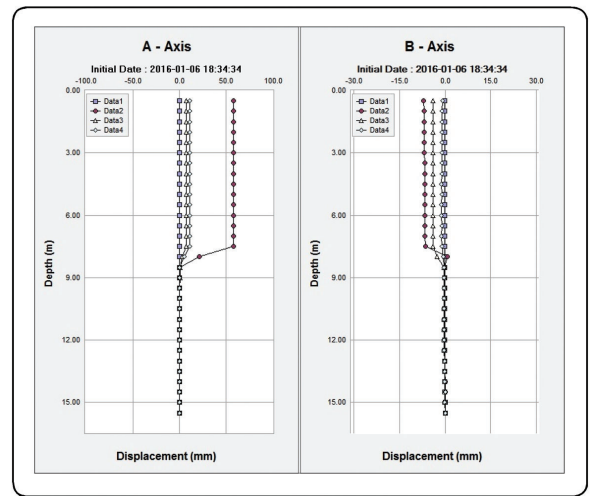
Digital inclinometer probe provides excellent resolution and accuracy because it built in $\pm 30^\circ$ MEMS inclined acceleration sensor and 2-axis electronic circuit inside.



[Theory of displacement calculating]



[Smart device _Inclinometer Collector]



[PC_Geopro graph]

Digital vertical inclinometer system

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Features

- High-speed measurement**
 The overall measuring and storage time between each point (50cm interval) has been improved within 5 seconds included 1 second of stabilizing time.
- Easy to carry**
 The digital inclinometer probe, Bluetooth reel, and cable guide are mounted in one carriage so that it is easy to carry and handle at work site.
- Applied durable control cable**
 The control cable are composed with $\varnothing 6$ mm polyurethane outside and $\varnothing 3$ mm aramid fiber inside so that it holds over 200kg·f weight.
- Applied lightweight digital inclinometer probe**
 It is designed to carry easily. The probe size is $\varnothing 25.4$ mm \times 687 mm and weight is 1.3kg
- The data transitions and store by smart device**
 It is possible to download application "Inclinometer Collector" at Google play store and it can be used in any smart devices that android 4.3 or later OS is applied
- The interwork with PC software**
 The application "Inclinometer Collector" interworks with Geopro V3.0 which is verified program for a long time.
- Linkage Bluetooth**
 The Bluetooth has own module code so that it can connect with Bluetooth reel and smart device easily.
- Applied rechargeable Bluetooth reel**
 It is applied rechargeable battery inside of Bluetooth reel. Therefore, it is possible to use 40Hr (based on 20°C) continuously after single charging.

Explanation

[Digital inclinometer probe]



Model 5481 Digital inclinometer probe provides excellent resolution and accuracy because it built in $\pm 30^\circ$ MEMS inclined acceleration sensor and 2-axis electronic circuit inside

MEMS acceleration sensor detect the inclination amount of displacement accurately because it does not substantially affected by the vibration.

The outer diameter of digital inclinometer probe is $\varnothing 25.4$ mm with STS steel. Also, it can be used inner diameter $\varnothing 48$ mm ~ $\varnothing 85$ mm inclinometer casings.

This probe is composed with bearings and springs and it made by STS 316 so that it can be used for a long time.

[Control cable and Bluetooth reel]



The Bluetooth reel is composed with reel and control cable. Bluetooth circuit is built in reel and connected control cable basically. The control cables have 5 signal wires and cover with $\varnothing 3$ mm Kevlar and then, extrude with $\varnothing 6$ mm polyurethane sheath.

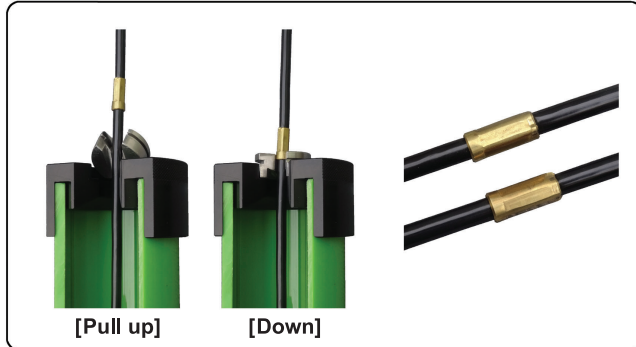
Also, the brass gaffs are graduated at every 50 cm intervals on control cable.

It is applied rechargeable battery inside of Bluetooth reel. Therefore, it is possible to use 40Hr continuously after single charging.

Digital vertical inclinometer system

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[Cable Guide]



During the monitoring, the cable guide helps the brass Gaff to be set on right place.

Our company's cable guide is designed with automatic hooks for quick and easy measurement.

[Operating program / Application software]



The operating program is "inclinometer collector". It is an application program only for digital vertical inclinometer system.

- **DATA STORAGE**

To set work site and borehole up first and to pull the digital inclinometer probe. Then, to read the data and save it.

- **VIEW DATA & PROFILE**

To find out displacement data and accumulated displacement graph.

- **IMPORT DATA**

After copying e-mail or data by using the import data function, you can enter data files on different smartphones for continuous measurement and management.

- **SEND TO E-MAIL**

To send data that measured by smart device by e-mail. Then, it can be changed by Geopro program on PC.

Specification

Model		5481
Digital inclinometer probe (Vertical)	Applied sensor	2-MEMS sensor
	Measuring Range	$\pm 30^\circ$
	Resolution	0.005 _{mm} /500 _{mm}
	Rating output	Digital
	Nonlinearity	0.02% FSR / $\pm 10^\circ$
	Repeatability	$\pm 0.003^\circ$
	Shock coefficient	2000g
	Operating Temp.	-20 ~ 70 $^\circ$ C
	Wheel gage length	500 mm
	System accuracy	± 2 mm / 25m
	Dimension	$\varnothing 25.4 \times 687$ mm
	Weight	1.3 kg
	Material	Stainless steel
Water proof	1000m H ₂ O	
Accessories	Carry bag, Spanner	
Control cable	Operating Temp.	-25 ~ 80 $^\circ$ C
	Stiffener	$\varnothing 3$ mm Kevlar (Aramid fiber)
	Outer diameter	$\varnothing 6.0$ mm
	Wire	0.3mm ² \times 5C
	Max. tensile strength	200 kg \cdot f
	Material of cable	Polyurethane rubber
Cable guide	Weight	About 3.3kg / 50m
	Material	Aluminum
	Applied casing	Outer diameter $\varnothing 70, \varnothing 85$ mm casing
Bluetooth reel	Material	Polycarbonate
	Dimension	350(W) \times 250(D) \times 360(H) mm
	Status display	Power, Bluetooth, Charge
	Convenience	ON/OFF Switch Probe holder Cable guide holder
	Battery	Ni-MH 7.2V
	Weight	2.0kg
	Operation time	Cont' 40 Hr
	Charging time	Cont' 7 Hr
	Accessories	Charger, Carry bag
	Operating application	Application
Function		Data storage View data & graph Import data Send to e-mail
Device		Android 4.3 or later OS

Digital vertical inclinometer system

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Accessories



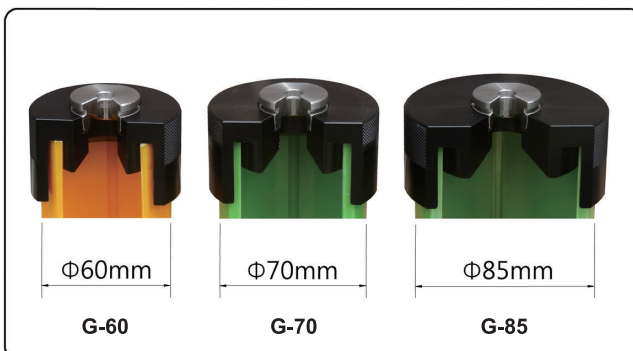
[Probe carry bag _ Parts code : 017110]

To provide a safe portable convenience about model 5481 digital probe, Inside of nylon bag is made by sponge pad. The bag is used to carry or to store control cable if no using a long time. The control cable needs to clean by oil after separating with probe.



[Bluetooth reel carry bag _ Parts code : 017301]

To provide a safe portable convenience about model 5481R bluetooth reel, Inside of nylon bag is made by sponge pad. In case of no using reel set or carrying control cable only, the bag can be used.



[Cable guides]

The cable guides for inclinometer casings are manufactured in three sizes as $\varnothing 60$, $\varnothing 70$, $\varnothing 85$ mm. The main product, $\varnothing 70$ mm casing, is supplied in the digital inclinometer set. $\varnothing 60$ and $\varnothing 85$ mm casings are sold separately.

STD control cables

Model	Description	Weight
5481R-30	30m Control cable & Bluetooth reel	3.5kg
5481R-50	50m Control cable & Bluetooth reel	4.4kg
5481R-75	75m Control cable & Bluetooth reel	5.8kg
5481R-100	100m Control cable & Bluetooth reel	7.0kg
5481R-150	150m Control cable & Bluetooth reel	9.5kg

※ It is required the special order for over 150m control cable and special Bluetooth reel.

Ancillary equipment

- Dummy probe (Model 5480D)
- Dummy probe reel (50m)
- Self calibrator (Model 5480C)
- Spiral sensor probe (Model 5480P)
- Wheel cartridge [Parts code: 017307]

Torsion spring [Parts code: 200019]

The wheel cartridge & torsion spring are purchasable items, and the wheel cartridge set can be used at site to easy replace of broken cartridge's wheel part.

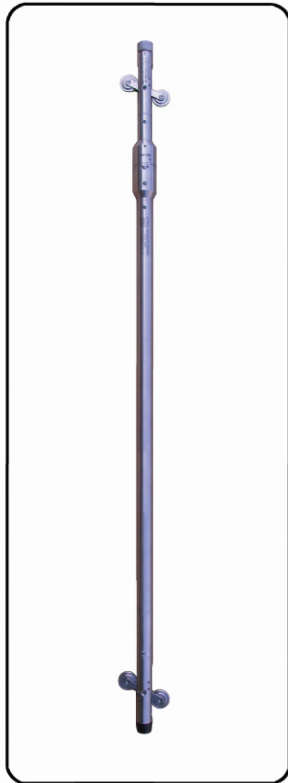


[Wheel cartridge & Torsion spring]

Digital vertical inclinometer system

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[Spiral sensor probe]



It 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.

The gage length is 1m and there is potentiometer in side of probe and can check out the twisting up to $\pm 10^\circ$ by each 1m.

It is also can connect to cable of data logger.

[Model 5480P spiral sensor probe]

Specification

Model	5480P
Sensor element	1 Rotary potentiometer
Range	$\pm 10^\circ$ Degree
Resolution	$\pm 0.01^\circ$
Accuracy	$\pm 0.5\%$ FSR
Dimension	$\varnothing 40 \times 1160\text{mm}$
Gage length	1000mm
Weight	2.0kg
Readout unit	ACE-1500

[Self calibration frame]

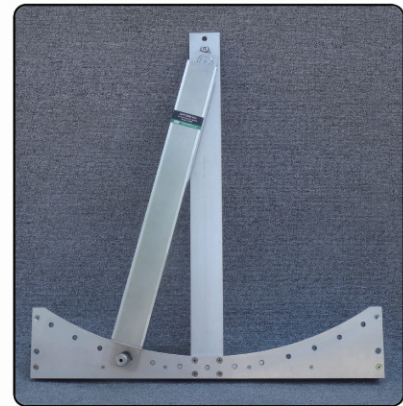
It is useful to check the condition of inclinometer probe or calibrate.

It is designed with "⊥" shape of aluminum frame and pivot which is hang behind of aluminum frame. Also, it can divide and calibrate 5 point as -10° , -5° , 0° , $+5^\circ$, $+10^\circ$.

.Aluminum frame which is anodizing can fix to the wall and it can use anytime as necessary.

Specification

Model	5480C
Material	Aluminum frame, Epoxy painting inclinometer case
Calibration point	13 point ($\pm 30^\circ / 5^\circ$ interval)
Dimension	$820 \times 800 \times 97\text{mm}$
Probe case	630mm
Weight	About 7.5 kg



[Model 5480C self-calibration frame]

[Dummy probe]

Model 5410D dummy probe is not real probe.

There is not sensor in it.

It is a kind of tester to find out condition of inclinometer casing.

In case of many different displacements happened at underground, inclinometer casing might be damaged or bent. At this time, push the dummy probe into inside of casing and to find out the condition of casing.

It is designed with STS $\varnothing 2\text{mm}$ wire rope



[Model 5480D dummy probe]