



IN-PLACE INCLINOMETER

HIGHLIGHTS:

- Inclinometer chain provides a complete displacement profile across a line
- Biaxial and uniaxial sensors for vertical or horizontal applications
- Compatible to standard inclinometer casing
- Monitoring can easily be automated
- Minimized cabling effort due to RS485 bus

APPLICATIONS:

In-Place Inclinometers are applied in situations, where the usage of mobile units is too time-consuming or where permanent, online and real-time monitoring is required.

Typical applications are:

- ▲ Monitoring of diaphragm walls, supporting deep excavations
- ▲ Landslide monitoring to provide early warning
- ▲ Determination of rate and extend of deformations of retaining walls, embankments and earth fill.
- ▲ Monitoring of behavior of roof pipe umbrellas
- ▲ Monitoring of settlement and heave beyond foundations and surface structures due to excavation activities

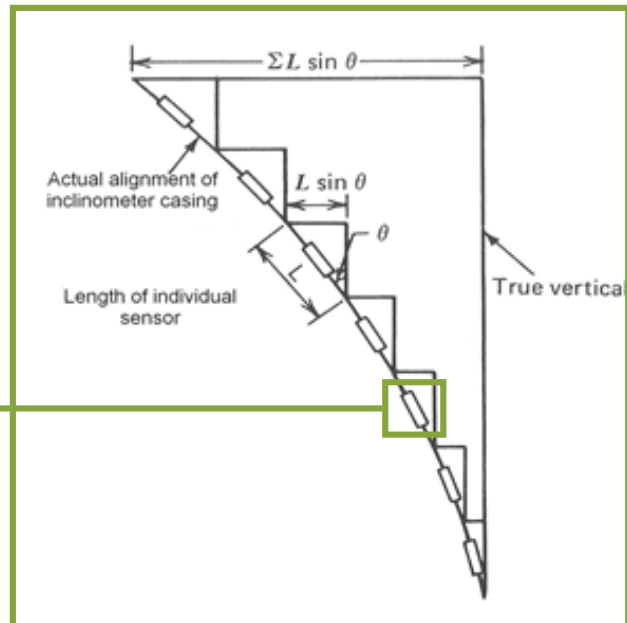
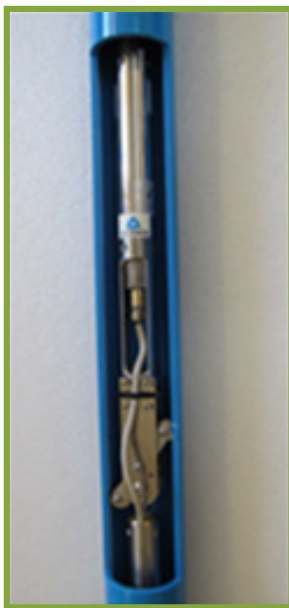


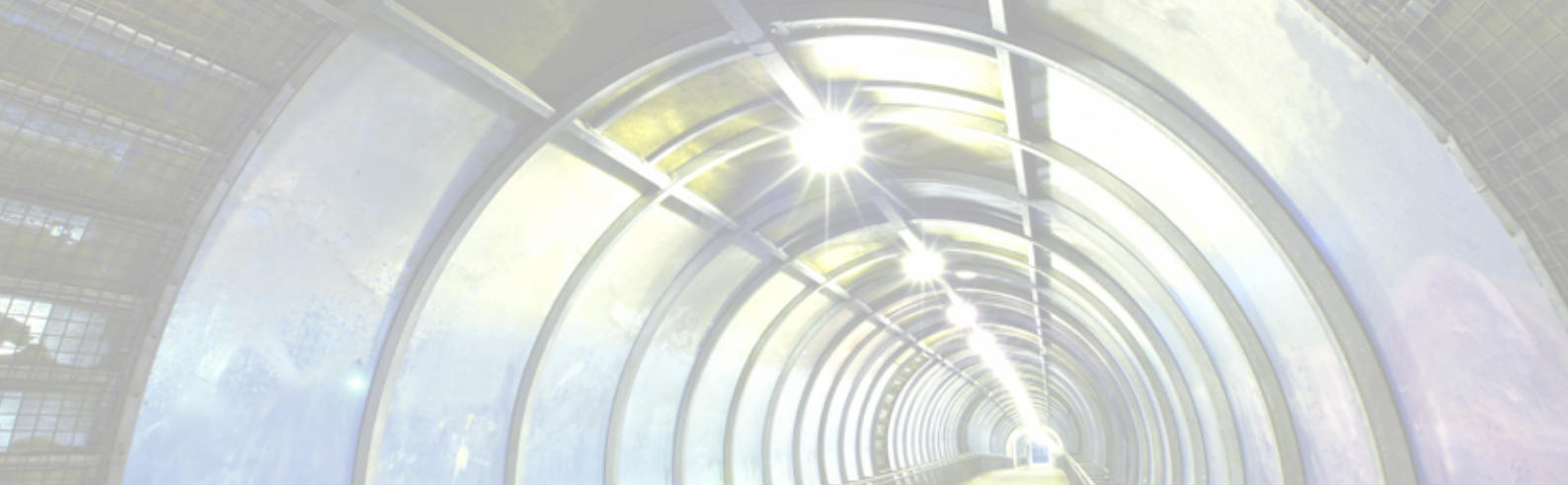
WORKING PRINCIPLE

An In-Place inclinometer system consists of a series of inclinometer sensors, which are chain-like, connected to each other. The complete chain is positioned inside the inclinometer casing. The individual sensors are fixed by a spring loaded pivoted wheel set and connected to each other by ball joints. The measured tilts are multiplied with the associated sensor length.

Cumulating these products provides the deformation curve with respect to a zero reading.

For vertical installation the probes are usually equipped with two perpendicular tilt sensors. By this way lateral thrust can be observed in two directions.





CONSTRUCTION & DATA ACQUISITION

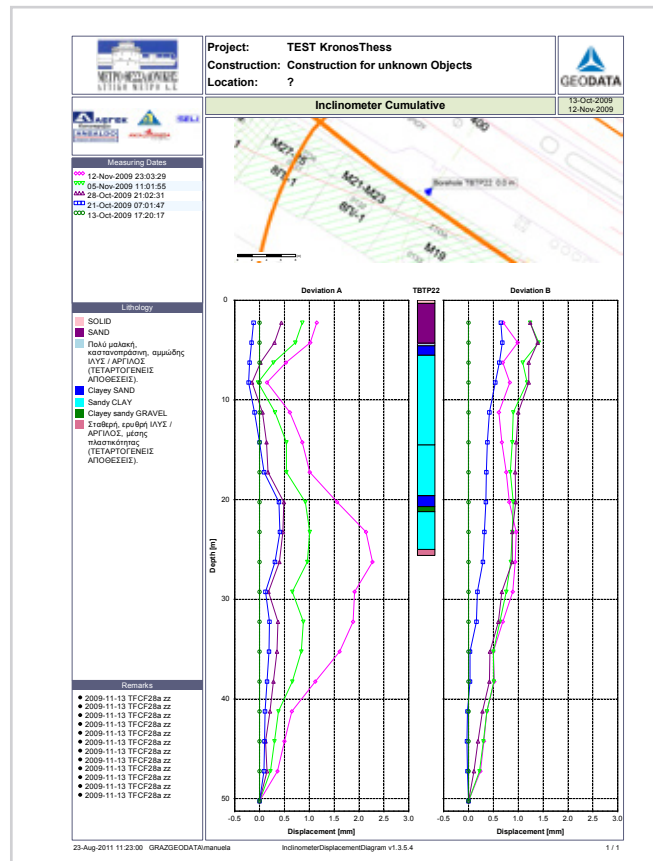
The core of each probe is a high accuracy MEMS accelerometer providing the tilt with respect to gravity. The sensor signals are digitized by a 20 bit AD-converter, corrected and temperature compensated by a microcontroller and transferred to a central recording unit via a bus-capable RS485 interface.

This technique allows the installation of > 15 sensors within a low diameter inclinometer casing. The low power design and data transmission technique meets the Electric Compatibility Standard EN50121 1-4.

Special attention was turned to proper design of long term water tightness under pressures of > 8 bar.

Big diameter gauge tubes guarantee accurate measurements even for 3m probe length and horizontal installation.

The RS485 interface incorporates a simple ASCII protocol with sensor address, channel indicator, the tilt value in $\mu\text{m}/\text{m}$, temperature as well as a checksum.



SPECIFICATIONS

Sensor Type	MEMS
Calibration Ranges	± 15 ; ± 10 ; ± 6 degrees
Resolution	0,001 mm/m @ ± 10 deg range
Sensor Accuracy	0,05 mm/m @ ± 10 deg range
Water Tightness	10 bar
Output Signal	RS485 and ASCII protocol
Temperature Sensor	1 $\mu\text{A}/^\circ\text{C}$ integrated
Supply Voltage	9-24VDC
Sensor Diameter	30mm
Gauge Tube Meter	28mm
Gauge Length	0,5-2m standard, 3m on request
Housing	Stainless Steel
Extension Tube	Stainless Steel



ORDERING INFORMATION

In-Place Inclinator	Vertical
PED2001010	IPI-Sensor, custom length (0,5 to 3m),,1 axis, vertical, 1 wheel set , 1 ball joint, integrated cabling, plug set
PED2001012	IPI-Sensor, 2m,1 axis, vertical, 1 wheel set , 1 ball joint, integrated cabling, plug set
PED2001013	IPI-Sensor, 3m,1 axis, vertical, 1 wheel set , 1 ball joint, integrated cabling, plug set
PED2001020	IPI-Sensor, custom length (0,5 to 3m),2 axis, vertical, 1 wheel set , 1 ball joint, integrated cabling, plug set
PED2001022	IPI-Sensor, 2 m, 2 axis, vertical, 1 wheel set , 1 ball joint , integrated cabling, plug set
PED2001023	IPI-Sensor, 3m, 2 axis, vertical, 1 wheel set , 1 ball joint , integrated cabling, plug set
In-Place Inclinator	Horizontal / Inclined
PED2001030	IPI-Sensor, custom length(0,5 to 3m),1 axis, horizontal, 1 wheel set , 1 ball joint, integrated cabling, plug set
PED2001032	IPI-Sensor, 2 m, 1 axis, horizontal, 1 wheel set , 1 ball joint , integrated cabling, plug set
PED2001033	IPI-Sensor, 3m, 1 axis, horizontal, 1 wheel set , 1 ball joint , integrated cabling, plug set
Accessories	
PED2001040	End wheel assembly, vertical
PED2001045	End wheel assembly, horizontal
PED2001050	IPI-Headassembly for 71&84mm casing
PED2001060	RS485 Termination plug for IPI-Chain
PED2001070	Connection cable between top IPI and readout (plug & 1m cable standard, other calbe length to be specified)
PED2001080	Reverse voltage protection for bus and powersupply (Option)
Data Aquisition	
Please specify number of sensors and chains, possible network layout and requirements like reading frequency, alarm output, power supply....	

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Leoben Head Office
GEODATA group

Hans-Kudlich-Straße 28
8700 Leoben
Austria

Phone: +43 (0)3842 26555-0

Fax: + 43 (0)3842 26555-5

Mail: office@geodata.at

www.geodata.com

