innovation in geotechnical instrumentation

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RST Instruments Ltd.
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ISO 9001

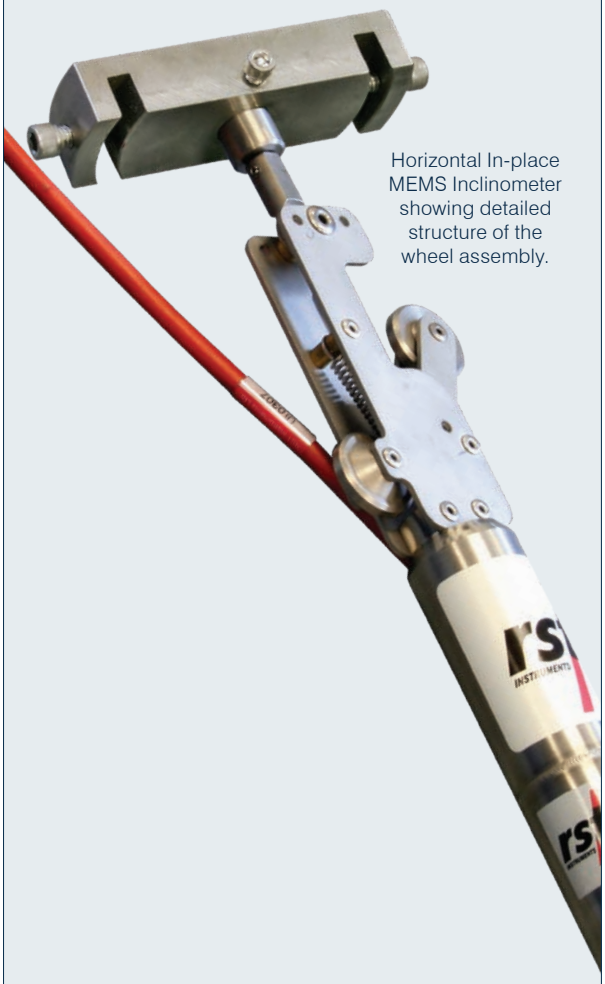
PRODUCT CATEGORY:
INCLINOMETERS + TILT SENSORS

Digital Bus Horizontal In-place Inclinometer System

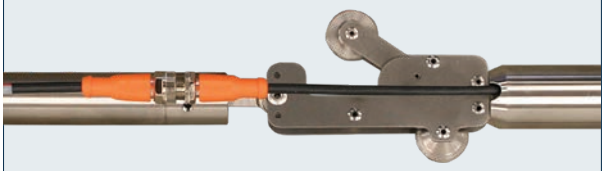
The Horizontal In-place MEMS Inclinometer is designed to remotely monitor, and continuously measure, underground vertical movement as a result of construction and excavation and any settlement that may occur around tunnels, dams, embankments and landfills.

These inclinometers consist of one or more MEMS inclinometer sensors housed inside a 31.75 mm (1.25 in.) diameter, water-tight, stainless steel enclosure. Each sensor is separated from the next by stainless steel rods and wheel assemblies; however, the entire system is connected by a digital bus system which consists of one single cable running the length of the entire chain of connected sensors; this eliminates the need of a separate cable for each sensor and reduces the amount of cable to be managed. Rod lengths can be varied to alter the bay length and sensors can be concentrated in areas of expected movement. An optional analog cable system is also available.

Wheel assemblies are sized to fit 70 mm (2.75 in.) or 85 mm (3.34 in.) O.D. inclinometer casing. As movement occurs and the inclinometer casing deforms, each sensor can be automatically monitored and can be read at a remote readout location. If necessary, an alarm can be triggered when movement reaches a preset critical rate or magnitude.



Horizontal In-place MEMS Inclinometer showing detailed structure of the wheel assembly.



A close-up shows the single cable which connects each sensor along the entire chain of inclinometer sensors forming a “digital bus.”

> WHY IT IS IMPORTANT

Provides constant remote monitoring; early warning of movements is essential for protecting life and equipment.

> APPLICATIONS

Ideal for monitoring of:

- Stability adjacent to excavations or underground workings.
- Settlement and vertical movements around tunnels, dams, embanksments, roadways, storage tanks, and landfills.
- Continuous, automated reading where early warning of movements is essential for protecting life and equipment.

> FEATURES

- Highly cost effective per sensor point.
- On board electronics.
- Removable.
- High precision, wheeled probe.
- Easy adaptability to data logging.

> BENEFITS

- ✓ **Increase Safety**
- ✓ **Increase Productivity**
- ✓ **High Reliability**
- ✓ **Custom Options**
- ✓ **High Accuracy**
- ✓ **Cost effective per sensor point**

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SPECIFICATIONS + ORDERING

SPECIFICATIONS

ELECTRICAL	
ITEM	**SPECIFICATION**
Range	±15°
Resolution (digital)	±2 arc sec. (±0.0006°) (0.01 mm/m)
Resolution (analog)	±5 arc sec. (±0.025 mm/m) (10Hz BW)
Non-linearity (digital)	±0.0125% F.S. (±0.002°) (0.03 mm/m)
Non-linearity (analog)	±0.05% F.S. (±0.0075°) (0.13 mm/m)
Repeatability (digital)	±0.0125% F.S. (±0.002°) (0.03 mm/m)
Repeatability (analog)	±0.025% F.S. (±0.004°) (0.06 mm/m)
Sensor	MEMS (Micro-Electro-Mechanical Systems) Accelerometer
Sensor Offset	+/- 0.002 arc deg./deg. C
Sensor Sensitivity	+/- 0.013 % of reading/deg. C
Excitation (analog)	8 - 15V DC
Operating Temp.	-40 to 85°C (-40 to 185°F)
Ingress Protection	IP68 to 200m H_20 (2000 kPa)
MECHANICAL	
Gauge Length	0.5 - 3 meters
Housing Diameter	31.75mm (1.25 in.) (sensor)
Wheel Assembly	70 mm (2.75 in.) 85 mm (3.34 in.)
Extension Rod Diameter	25 mm (1.0 in.)

ORDERING: GENERAL INFO REQUIRED

Part number	Number of boreholes
Number of sensors per borehole	Location of sensors in borehole
Bay length	Wheel assembly size
Length of signal cable	

OPTIONS

Submersible cable connector for bus options.

ORDERING: SENSORS

DIGITAL BUS CABLE SYSTEM	PART #
MEMS IPI bus sensor assembly: Uniaxial for 70 mm casing	IC7650
MEMS IPI bus sensor assembly: Uniaxial for 85 mm casing	IC7655
ANALOG CABLE SYSTEM	**PART #**
MEMS IPI sensor assembly: Uniaxial for 70 mm casing	IC7600
MEMS IPI sensor assembly: Uniaxial for 85 mm casing	IC7605

ORDERING: COLLAR HANGERS

DIGITAL BUS SYSTEM OR ANALOG	PART #
Hanger & Wheel Assembly 70 mm casing	IC7070H
Hanger & Wheel Assembly 85 mm casing	IC7085H

ORDERING: BAY RODS

DIGITAL BUS SYSTEM AND ANALOG	PART #
Bay rod for 0.5 m gauge length	IC7700
Bay rod for 1 m gauge length	IC7701
Bay rod for 1.5 m gauge length	IC7702
Bay rod for 2 m gauge length	IC7703
Bay rod for 2.5 m gauge length	IC7704
Bay rod for 3 m gauge length	IC7705

ORDERING: CABLES

DIGITAL BUS SYSTEM AND ANALOG	PART #
4 conductor, 22 gauge polyurethane jacketed cable (digital bus)	EL380004
6 conductor, 22 gauge polyurethane jacketed cable (analog)	EL380006

ORDERING: READOUTS

READOUTS & DATA LOGGERS	PART #
Ultra Rugged Field PC2 (digital bus systems)	IC32000-AR2-RSTS
Digital Interface for Ultra Rugged Field PC2 with software	ELGL4010
MEMS Analog Readout (analog systems)	IC6800-V
flexDAQ Data loggers (analog and digital systems)	

IMPERIAL LENGTHS AVAILABLE UPON REQUEST

Please contact RST for details.

MEMS TILT & INCLINATION SERIES

WORKS WITH flexDAQ DATALOGGERS — READY TO RUN: pre-assembled, pre-wired, pre-tested, pre-programmed