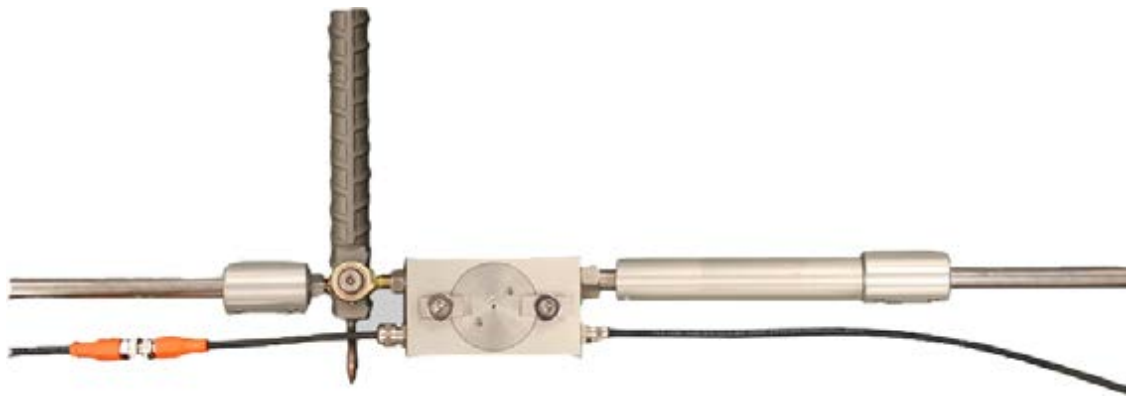


## Tunnel Profile Monitoring System

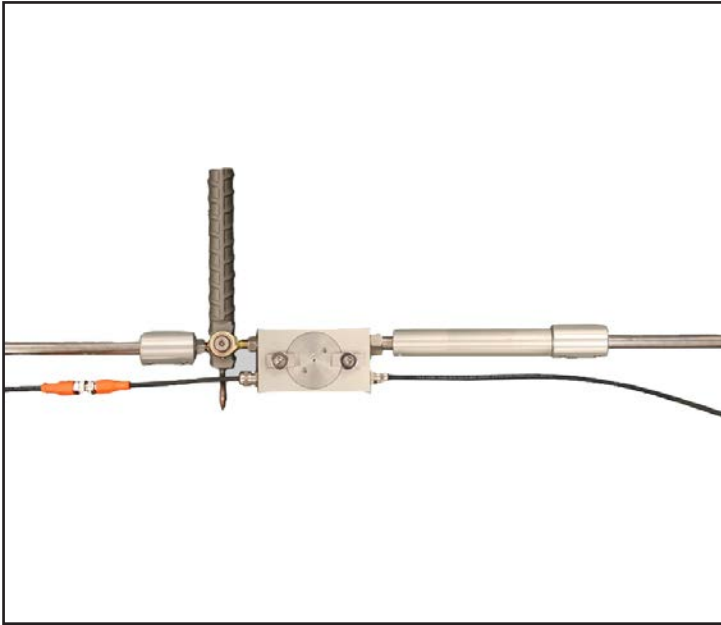
Used to monitor strain along stranded anchors. The low profile design means that multiple sensors can be installed along the bonded length of strand anchors



# Tunnel Profile Monitoring System



## Overview



The Tunnel Profile Monitoring System is a series of linked rods fixed to the tunnel wall to monitor deformation. A data logging system and related software is available to provide near real time displacement and generate a graphical representation of the tunnel performance.

A system of linked arms is affixed to the tunnel wall. Each arm is fitted with a high accuracy displacement sensor and precision tilt meter. Spatial displacement of the pins and arms results in changed tilt and displacement readings. The data logger system automatically collects the data and transmits it to a computer. The computer then analyses the data and calculates the displacement profile for presentation.

The system is available in either open or closed loop configuration. The closed loop method is analogous to conventional closed end survey techniques, while the open loop must be referenced to a know location.

### APPLICATIONS

Monitor underground openings during construction for control and safety

Monitor tunnel deformation due to nearby construction activities

Monitor long-term deformation and performance of existing tunnels

### FEATURES

Very low profile design, suitable for installation in the tight space available around TBMs

No tunnel traffic interference

Digital Bussed: single cable per arm to simplify installation and reduce cost

Direct measurement of displacement rather than calculating displacement from a tilt measurement

Immune to the air density related problems inherent in optical systems

On-board electronics to minimise electrical noise problems, and permit tilt sensor calibration independent of cable length effects. Cable length may be changed without affecting sensor calibration

Near-real time software with full graphic and alarm capability

Built-in connectors for manual tape extensometer connection to verify operation, and aid in initial installation and commissioning



# Tunnel Profile Monitoring System

## Specifications

### DISPLACEMENT SENSOR

Total Mechanical Travel	25mm
Shock	50 g 11 ms half sine
Vibration	20 g ms 5 Hz to 2 KHz
Life	One billion operations
Independent Linearity	0.25%
Operating Temperature	-40 to 80°C
Resolution	Infinite
Accuracy	0.06mm

### TILT SENSOR SPECIFICATIONS

Range	±15° (other ranges upon request)
Resolution	±2 arc sec. (±0.0006°) (0.01 mm/m)
Nonlinearity	±0.0125% FS (±0.002°) (0.03 mm/m)
Repeatability	±0.0125% FS (±0.002°) (0.03 mm/m)
Sensor	MEMS (Micro-Electro-Mechanical Systems) Accelerometer, Uniaxial
Operating Temperature	-40 to 85°C
Cable	Type 800 - Multi-core with Braid

### SYSTEM COMPONENTS

Tilt/displacement sensor assembly
Extension tube
Electrical cable sensor to logger
Reference pin comes with tape extensometer connector
Data logger system
GeoAxiom software
Manual



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