

# MEMS Digital Tiltmeter

## Applications

The Model 6101D MEMS Digital Tiltmeter is designed to measure tilt in structures including...

- Buildings
- Dams
- Embankments
- Slopes
- Excavation walls
- Open pits



• Model 6101D MEMS Digital Tiltmeter shown with Model 6201-1C Ceramic Tiltplate.

## Operating Principle

The Model 6101D MEMS Digital Tiltmeter is a portable device designed to measure tilt in structures such as buildings, dams and embankments and also for measurements related to the stability of slopes, open pits and the walls of excavations (e.g. slurry walls).

In use, the tiltmeter is placed on a tiltplate that has been permanently attached to the structure to be monitored. The tiltmeter contains two MEMS sensors set at 90 degrees so that the tilt in two orthogonal axes, A and B, can be obtained with each placement of the tiltmeter on the tiltplate. Measurements can be made on horizontal or vertical surfaces. The readings on the A and B axes are taken in pairs, 180 degrees to each other, to eliminate instrument bias and thereby obtain true tilt. Subsequent sets of readings show how the structure is behaving and will give an indication of any tilting as time progresses.

## Advantages and Limitations

The Model 6101D was designed as a low-cost, portable tiltmeter, for use in various locations, with a standard resolution of  $\pm 4$  arc seconds (when used with the Model FPC-2 Field PC).

The sensor has outstanding temperature stability, with minimal warm-up time and very low power requirements, provided by the internal 7.4 V Lithium battery.

The electronics and sensor are enclosed inside a fully sealed, waterproof housing and signal transmission to the Model FPC-2 Field PC is achieved via **Bluetooth®** wireless technology.

The sensing elements are two highly accurate MEMS tilt sensors, which are practically immune to shock.



● Model FPC-2 Field PC showing a Live Tiltmeter Data reading screen shot.



● Model 6201-1C Ceramic, 6201-1A Anodized Aluminum and 6201-1S Stainless Steel Tiltplates (tiltplates are permanently attached to structure being monitored).

### System Components

The heart of the tiltmeter is a pair of state-of-the-art MEMS (Micro-Electro-Mechanical Systems) sensors, elements with onboard self-test electronics and temperature compensation. The MEMS sensors are highly accurate and stable, and practically immune to temperature changes and shocks.

The Model 6101D MEMS Digital Tiltmeter is used in conjunction with Model FPC-2 Field PC (see inset photo at left).

Three styles of tiltplates are available – ceramic, aluminum and stainless steel. The stainless steel tiltplates are recommended where vandalism may be a problem.

### Technical Specifications

Full Scale Range	±15°
Resolution	±0.02 mm/m (±4 arc seconds)
Accuracy <sup>1</sup>	±0.05 mm/m (±10 arc seconds)
Non-Linearity & Hysteresis	0.02% F.S.
Output	Digital
Temperature Range	-40 °C to +70 °C (operating, storage)
Shock Survival	20,000 g
Weight	6.5 kg (including case)
Dimensions (L x W x H)	172 x 102 x 166 mm

<sup>1</sup>Established under laboratory conditions.