MEMS Tiltmeter

Applications
The MEMS tiltmeter is a compact, waterproof tiltmeter with a range of ±10° from vertical. It is used to monitor changes in the inclination of a structure. Applications for the tiltmeter include:
- Monitoring rotation of retaining walls, piers, and piles.
- Providing early warning of potential structural damage.
- Documenting any effects of nearby deep excavations.

Operation
The MEMS tiltmeter measures tilt over a range of ±10° from vertical and is available in uniaxial and biaxial versions. Signal conditioning makes the tiltmeter compatible with most data loggers.

The tiltmeter is fixed to the structure via an angle bracket that can be welded to steel or bolted to an anchor set into concrete or rock. Because the tiltmeter has a relatively wide range, careful zeroing of the sensor is not required.

Readings are obtained with a data logger or a portable readout. The initial reading is used as a baseline. Changes in the inclination of the structure are found by comparing current readings to the initial.

Advantages
Mounts Anywhere: The tiltmeter is supplied with a bracket that can be welded to steel or bolted to anchors.

Wide Range: The tiltmeter has a range of ±10°, so it can be installed without careful zeroing.

Uniaxial or Biaxial: The tiltmeter is available in uniaxial and biaxial versions.

Waterproof: The tiltmeter can tolerate submersion.

Suitable for Automatic Readings: The tiltmeter outputs a voltage signal that can be read by most data loggers. It can also be read manually with the EL/MEMS Data Recorder.
TILTMETER SPECIFICATIONS
MEMS Tiltmeter, Uniaxial  . . . . 57803101
MEMS Tiltmeter, Biaxial  . . . . 57803102
Tiltmeter includes angle bracket, 5 m of signal
cable, calibration record, an user manual. Anchor
is not included.
Sensor Type: MEMS (Micro Electro-Mechanical
Systems) sensor for tilt readings and a 3K ohm
thermistor for temperature readings.
Range: ±10 degrees.
Resolution: 9 arc seconds, using a 13 bit
readout device such as the CR10 datalogger.
Repeatability: ±22 arc seconds.
Calibration: 11-point calibration taken at three
temperatures from -8 to 40 °C.
Input Power: 8 to 15 Vdc.
Output Signal: ±2.5 Vdc.
Body: Stainless steel. Waterproof to 20m.
Dimensions: 32 x 190 mm (1.25 x 7.5”).
Mounting stud is M8.

SIGNAL CABLE
Signal Cable  . . . . . . . . . . . . . 50613527
Cable has seven 22-gauge tinned-copper con-
ductors, shield, and polyurethane jacket. The
standard product includes 5 m of cable. Custom
lengths of cable can be special ordered.

MOUNTING BRACKETS
Angle Bracket  . . . . . . . . . . . . .  included
The angle bracket included with the tiltmeter is
suitable for most applications. It can be welded
to steel or bolted to an anchor. The bracket does
not include an anchor.
Embedment Mounting Bracket  . . 97803115
This special-order bracket provides a way to
stand the tiltmeter on sloping surfaces, such as
the concrete face of a rock-fill dam. The bracket
is grouted into a drill hole.

ANCHORS
Anchors are used in concrete or rock. Order one
anchor per tiltmeter.

SIGNAL CABLE
Expansion Anchor  . . . . . . . . . . . . 57803128
Includes anchor, bolt, and washer. Install in 9.5 x
64 mm (3/8 x 2.5”) drill hole.

Groutable Anchor with Bolt  . . . . . .57803130
Includes anchor, bolt, and washer. Install in 13 x
90mm (0.5 x 3.5”) drill hole. Requires epoxy
grout below.
Epoxy Grout Kit  . . . . . . . . . . . . . 57803133
Includes plastic dispenser and cartridge of quick-
set epoxy grout. Sufficient for 15 anchors.

PORTABLE READOUT
EL/ MEMS Data Recorder  . . . . . . .56813500
Terminal Box for 12 Sensors  . . . .57711600
Jumper Cable  . . . . . . . . . . . . . . . . . 56813557
The EL/ MEMS Data Recorder is a portable read-
out that displays and stores tilt readings in volts
and temperature readings in degrees C. Includes
software for transferring stored readings to a
Windows PC.
Terminal box allows connection of up to 12 tilt-
meters. Sensors are selected by a rotary switch.
Fiberglass box measures 290 x 345 x 135mm
(11.5 x 13.5 x 5.25”).
Jumper cable is required to connect the Data
Recorder to the terminal box.

DATA LOGGERS
M-Logger  . . . . . . . . . . . . . . . . . .58810100
The M-Logger, shown above, is a simple data
logger dedicated to MEMS sensors. It reads one
tiltmeter connected directly or up to 16 sensors
via a multiplexer. See separate datasheet.
Campbell Scientific Loggers
The Campbell Scientific CR1000 data logger
allows direct connection of two biaxial sensors
or three uniaxial sensors. Adding a multiplexer
increases the capacity to 16 uniaxial or biaxial
sensors. Up to five multiplexers can be added to
the CR1000 data logger. See separate datasheet.