

## MEMS In-Place Tilt Meter



Proven MEMS technology  
Uniaxial & biaxial options  
Excellent thermal stability  
Single cable digital BUS system  
High accuracy & resolution



# MEMS In-Place Tilt Meter



## Overview



The Geosense® MEMS In-Place Tilt Meter measures uniaxial or biaxial tilt, which is measured from the plane(s) perpendicular to the base.

It is designed to be installed in either the vertical or horizontal position by either bonding, bolting or strong magnetic fixing directly to a structure or mounting plate.

The tilt sensors, based on well-established MEMS technology, are mounted within a rugged, heavy-duty waterproof die-cast metal enclosure suitable for the harsh environments found within construction and building industries.

Thermal effects of the MEMS sensor is minimal but in order to compensate for the effects of temperature on the enclosure, mountings and structure, the unit is fitted with an integral thermistor.

The digital RS-485 output signal provides the ultimate in accuracy together with the advantage of being able to create a digital BUS system where all sensors can be linked together and cable quantities significantly reduced.

Each unit is individually calibrated to provide the ultimate in system accuracy and repeatability.

## APPLICATIONS

For monitoring tilt in:

Retaining walls

Diaphragm walls

Concrete dams

Party walls

Structures

Bridge piers

Tunnels

Compensation grouting

Slopes

Piles

## FEATURES

EMC compliant to EN61326-1:2013

Uniaxial and Biaxial options

High accuracy and resolution

Uniaxial or biaxial sensors option

LSHF cable option

Excellent thermal stability

Horizontal or vertical mounting

Easy to install

Digital bus available (RS-485)

IP67 waterproof enclosure

Durable powder coating

LUL approved Product ID 3577



# MEMS In-Place Tilt Meter

## Specifications - Digital

### DIGITAL

MODELS	IPTM-M 5-1-485	IPTM-M 5-2-485	IPTM-M 10-1-485	IPTM-M 10-2-485	IPTM-M 15-1-485	IPTM-M 15-2-485
Range	±5°	±5°	±10°	±10°	±15°	±15°
Axis	Uniaxial	Biaxial	Uniaxial	Biaxial	Uniaxial	Biaxial

### PERFORMANCE

Signal Output	RS-485/BUS	RS-485/BUS	RS-485/BUS	RS-485/BUS	RS-485/BUS	RS-485/BUS
Accuracy <sup>1</sup>	±0.0013° ±4.68 arc sec ±0.02 mm/m ±0.013% FS	±0.0013° ±4.68 arc sec ±0.02 mm/m ±0.013% FS	±0.002° ±7.2 arc sec ±0.035 mm/m ±0.01% FS	±0.002° ±7.2 arc sec ±0.07 mm/m ±0.01% FS	±0.004° ±13.5 arc sec ±0.07 mm/m ±0.0125% FS	±0.004° ±13.5 arc sec ±0.07mm/m ±0.0125% FS
Resolution	0.0005° 2 arc sec 0.01 mm/m 0.0015% FS	0.0005° 2 arc sec 0.01 mm/m 0.0015% FS	0.0005° 2 arc sec 0.01 mm/m 0.0015% FS	0.0005° 2 arc sec 0.01 mm/m 0.0015% FS	0.0005° 2 arc sec 0.01 mm/m 0.0015% FS	0.0005° 2 arc sec 0.01 mm/m 0.0015% FS
Repeatability	±0.002° ±7.2 arc sec ±0.03 mm/m ±0.02% FS	±0.002° ±7.2 arc sec ±0.03 mm/m ±0.02% FS	±0.002° ±7.2 arc sec ±0.03 mm/m ±0.01% FS	±0.002° ±7.2 arc sec ±0.03 mm/m ±0.01% FS	±0.002° ±7.2 arc sec ±0.03 mm/m ±0.007% FS	±0.002° ±7.2 arc sec ±0.03 mm/m ±0.007% FS
Operating Temperature	-40 to + 85°C	-40 to + 85°C	-40 to + 85°C	-40 to + 85°C	-40 to + 85°C	-40 to + 85°C

### ELECTRICAL

Sensor	MEMS
Excitation	8-15VDC

### PHYSICAL

Protection	IP67
Dimensions	160 x 85 x 60mm
Weight	950g

### MATERIALS

Sensor enclosure	Die-cast aluminium
------------------	--------------------

### EXTENSION CABLE<sup>2</sup> (If required, to extend to data logger)

Cable	Type 800 Multi-core with Braid
-------	--------------------------------

<sup>1</sup> Using 3rd order polynomial

<sup>2</sup> Please note, voltage output will be affected by cable length

# MEMS In-Place Tilt Meter



## Specifications - Analogue

### ANALOGUE (4-20mA)

MODELS	IPTM-M 15-1-420	IPTM-M 15-2-420
Range	±15°	±15°
Axis	Uniaxial	Biaxial
Signal Output	4-20mA	4-20mA
Accuracy <sup>1</sup>	±0.005° ±18 arc sec ±0.1mm/m ±0.017% FS	±0.005° ±18 arc sec ±0.01mm/m ±0.017% FS
Resolution	0.0019° 7 arc sec 0.033 mm/m 0.007% FS	0.0019° 7 arc sec 0.033 mm/m 0.007% FS
Repeatability	±0.002° ±7.2 arc sec ±0.03 mm/m ±0.007% FS	±0.002° ±7.2 arc sec ±0.034 mm/m ±0.007% FS
Operating Temperature	-40 to +85°C	-40 to +85°C

### ELECTRICAL

Sensor	MEMS
Excitation	8-15VDC

### PHYSICAL

Protection	IP67
Dimensions	160 x 85 x 60mm
Weight	980g

### MATERIALS

Sensor enclosure	Die-cast aluminium
------------------	--------------------

### EXTENSION CABLE<sup>2</sup> (If required, to extend to data logger)

Cable	Type 800 Multi-core with Braid
-------	--------------------------------

<sup>1</sup> Readout dependent

<sup>2</sup> Please note, voltage output will be affected by cable length

# MEMS In-Place Tilt Meter

## Accessories & Ordering Information

---

### MOUNTING BRACKETS<sup>1</sup>

---

**Vertical surface mounting bracket** (Pic 1) (G40-037A)

**Horizontal surface mounting bracket** (Pic 2) (G40-038A)

**Horizontal/vertical adjustable mounting bracket** (Pic 3) (G40-039)

---

### DATA ACQUISITION

---

**GeoLogger G8 Plus** – Specification will vary (G211-001)

**WI-SOS 480 Digital Node** - Wireless digital node that can be connected to a maximum of 30 IPI sensors (G216-046)

**RS-485 to RS-232 Interface** - Enables digital RS-485 sensors to be used with Campbell Scientific loggers (Q38-010)

**10" Windows Tablet** - Manual data display (G200-040)

---

### SOFTWARE

---

**GeoAxiom** – Software which provides data handling, storage, visualisation, alarms, reporting and web-based access. Specification will vary according to project requirement (T10-020)

**G-TILT** - Data display software for use with Windows Tablet

---

### ELECTRICAL

---

**Cable Type** - 800/TP/04/050/PUR/GY/8.0 (Q10-150)

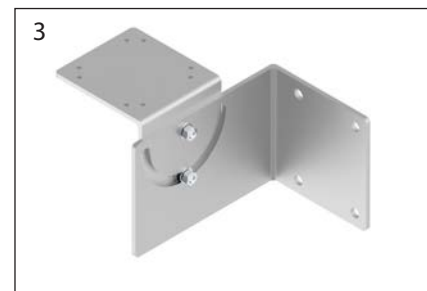
**End of line resistor /3.5m fly lead** – Right hand (Q12-101)

**End of line resistor /3.5m fly lead** – Left hand (Q12-101A)

**EMC Splice Kit** (Q12-105)

---

<sup>1</sup> Magnetic options available on request



---

### ORDERING INFORMATION

Range

---

Axis

---

Orientation

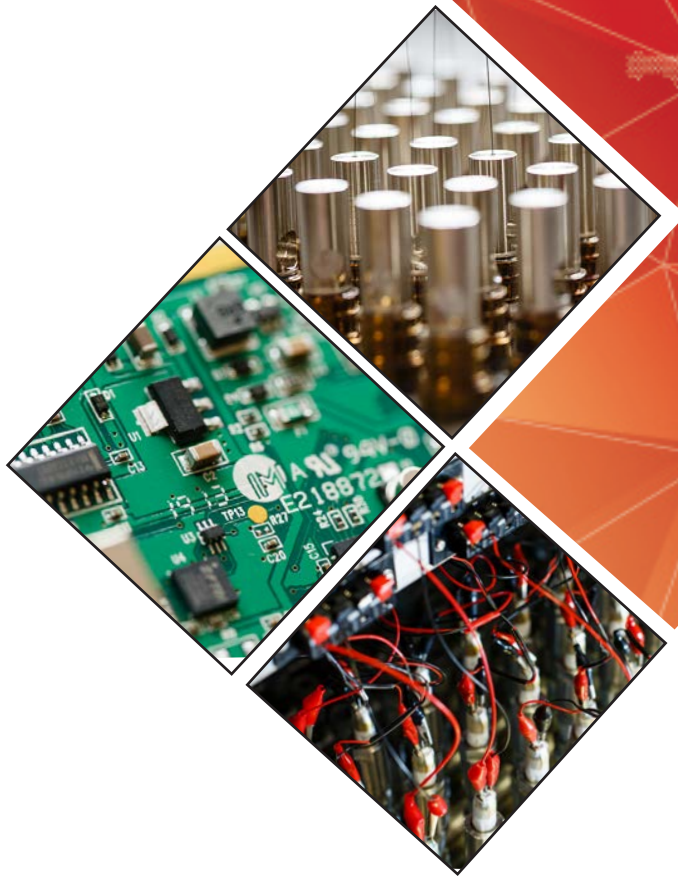
---

Bracket type

---

Readout

---



Geosense Ltd, Nova House, Rougham Industrial Estate, Rougham, Bury St Edmunds, Suffolk IP30 9ND, England

[www.geosense.co.uk](http://www.geosense.co.uk) e [sales@geosense.co.uk](mailto:sales@geosense.co.uk) t +44(0)1359 270457

Specifications are subject to change without notice and should not be construed as a commitment by Geosense. Geosense assumes no responsibility for any errors that may appear in this document. In no event shall Geosense be liable for incidental or consequential damages arising from the use of this document or the systems described in this document. All Content published or distributed by Geosense is made available for the purposes of general information. You are not permitted to publish our content or make any commercial use of our content without our express written consent. This material or any portion of this material may not be reproduced, duplicated, copied, sold, resold, edited, or modified without our express written consent.

V1.9 6/2023