



INSTRUCTION MANUAL

DIFFERENTIAL

MICRO-ACCELEROMETER TILTMETER

Model GEOCLINE

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This product should be installed and operated only by qualified personnel. Its misuse is potentially dangerous. The Company makes no warranty as to the information furnished in this manual and assumes no liability for damages resulting from the installation or use of this product. The information herein is subject to change without notification.

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1 PRODUCT

1.1 GENERAL DESCRIPTION

The GEOCLINE tiltmeter is rugged and field-proven, intended for use in harsh outdoor environments, in laboratories and factories. The GEOCLINE sensor and electronic signal conditioning circuitry are housed within a stainless steel cylinder. The sensory part, based on silica micro-manufactured technology provides quality measurements, high sensitivity, thermal stability, low signal/noise ratio, and EMF immunity.

Differential measurement of the two opposing sensors cancels measurement errors caused by thermal and long term drift and increases the sensitivity by a factor of two. Thermal cycle accelerated aging reduces parasitic instrument rotation and provides extremely high stability.

The 4-20 mA loop current transmission allows the GEOCLINE to be read with a portable readout unit or data acquisition system. The 4-20 mA output allows the use of long cables without the loss of signal quality. The cable entry is triple sealed to withstand pressure up to 1 000 kPa (100 meters of water).

The GEOCLINE is available in a Square Model bracket for wall mounting or Housing Model suited for borehole installation, mounting may be Uni-directional or Bi-directional.

1.2 SPECIFICATIONS

Range:	
- Model MAD X 02:	±0.2 radian
- Model MAD X 03:	±0.3 radian
	X = U (Uniaxial) or B (biaxial)
Resolution:	
	1x10 ⁻⁴ F.S.
Long term stability:	
	±5x10 ⁻⁴ F.S.
Mounting:	
- Uni-directional:	MAD U
- Bi-directional:	MAD B
Electrical:	
- Power supply:	12.24VDC
- Signal output:	4-20Ma
- Temperature:	-10 to +60°C
Dimensions:	
	200 x 150 x 100 mm (H x L x Dia. overall dimensions for wall mounted version)
Inclinometer casing specifications:	
- Internal diameter:	48.5 mm
- Groove depth:	3 mm
- Groove width:	5 mm
Weight:	
	3 kg with cover

Note: These specifications are met by GTI-1A inclinometer casing. The GEOCLINE may be adapted for use in other casing sizes, please contact ROCTEST TELEMAC.

2 INSTALLATION

The GEOCLINE is designed to be mounted directly on a solid vertical surface (protective cover available as an option) **see Figure 1** or within an inclinometer casing in borehole **see Figure 2**.

Pierce two holes for adjusting pins and for screws of 8 mm diameter with a distance of 145 mm between the two holes. Make sure that the two holes are well placed on a vertical angle, the mounting bracket however allows an adjustment of approximately $\pm 5^\circ$ on each axis of measurement (it is also possible to seal the attaching bolts, in this case make the holes a diameter adapted to the sealing compound used).

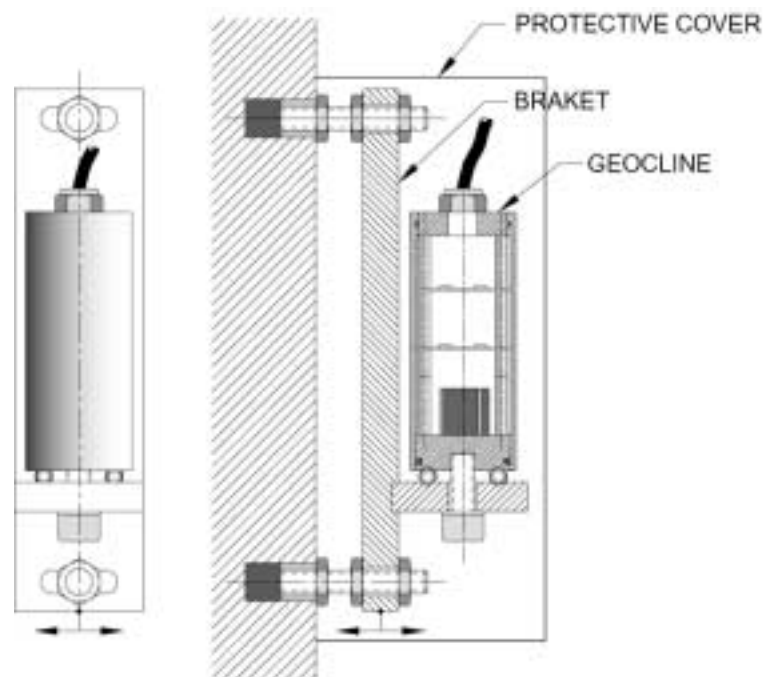


Figure 1: GEOCLINE Sensor Installation for Vertical Wall Mounting

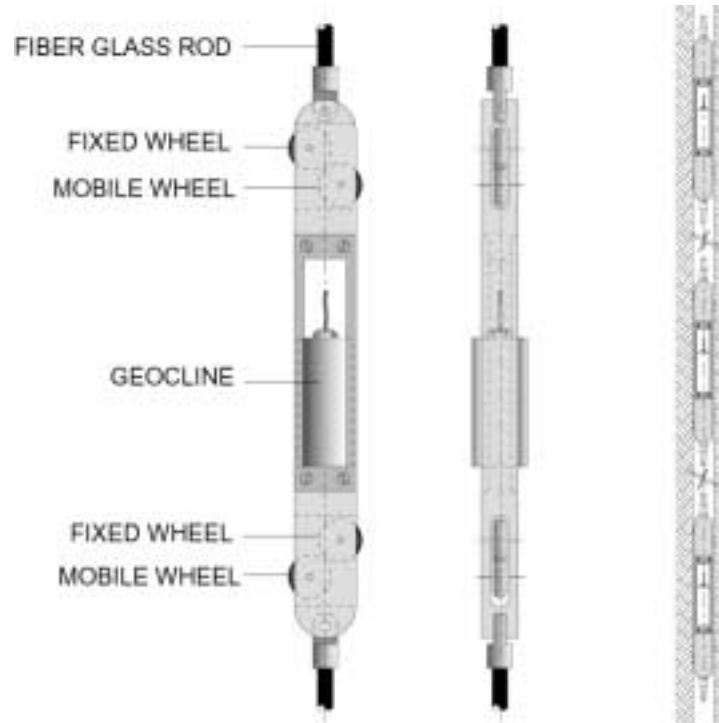


Figure 2: GEOCLINE Sensor Installation within a borehole

Place adjusting pins in the corresponding holes then fix the mounting bracket with two 8 mm diameter anchor bolts. If bolts are sealed, make sure the mounting bracket is well installed on bolts.

Place the GEOCLINE on the mounting bracket while making the three support pins align with three holes of the GEOCLINE tiltmeter. Only one position is possible, **see Figure 3**.

Then fix the GEOCLINE to the 6 mm diameter central screw. Tighten the screw without forcing too much (~ 1/8 turn of key). Make sure the support pins are well placed in the corresponding holes of the tiltmeter.

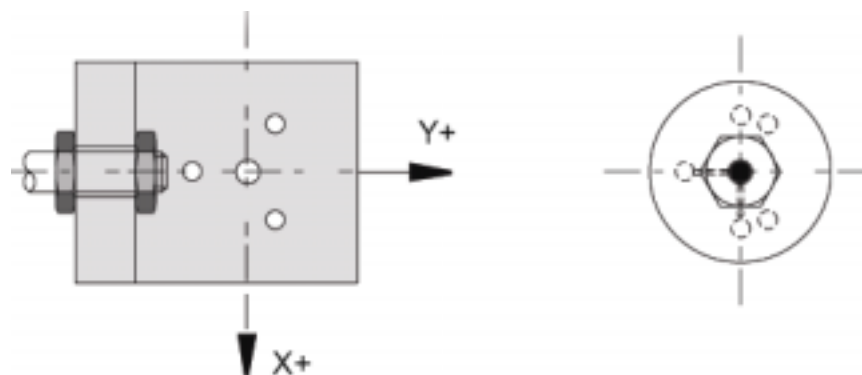


Figure 3: Top View of Mounting Bracket and Sensor

3 RESET

3.1 ZERO RESET

Zero reset does not have a direct influence on the measurement, the principle of being the study of the variations compared to the initial value. However, if the shift is too significant, one will miss part of the useful measuring range.

Zero reset is done by adjusting the position of the mounting bracket using the fastening bolts. In this case, it is necessary to have a voltmeter, for 4/20 mA sensor (*refer to chapter 3.3 using The FLUKE 705 Reading Station*).

Connect the cables individually from the voltmeter to the GEOCLINE sensors:

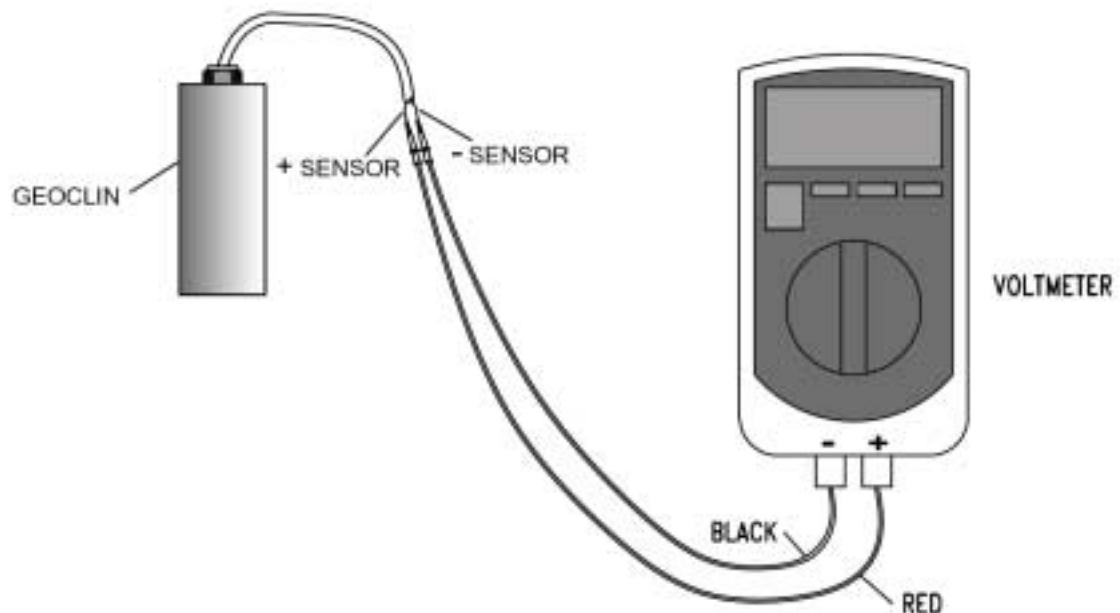


Figure 4: Voltmeter Connection to GEOCLINE Sensors

WIRE COLOR	UNIAXIAL	BIAXIAL
RED	+ SENSOR	+COMMON
BLACK	- SENSOR	- SENSOR X
WHITE	+ TEMP	- SENSOR Y
GREEN	- TEMP	- TEMP

Uniaxial GEOCLINE Y axis

- Lightly loosen one of the nuts from the upper bolt.
- Adjust the fastening bolts from the lower bolt by screwing them or unscrewing them to bring the reading to 12.00 mA on the reading station.

- Tighten the nuts from the upper bolt simultaneously when the reading is close to 12.00 mA. When the position is correct, tighten the nuts.
- Then vertically adjust the mounting bracket while tapping on the side to make it slide at the bottom.
- Tighten the nuts, by alternating upper bolt and lower bolt in order to maintain the adjustment.

Uniaxial GEOCLINE X axis

- Lightly loosen one of the nuts from the upper bolt.
- Adjust the fastening bolts from the lower bolt by screwing them or unscrewing them to vertically adjust the mounting bracket.
- Tighten the nuts from the upper bolt simultaneously when the mounting bracket comes to a vertical position. When the position is correct, tighten the nuts.
- Adjust the mounting bracket while tapping on the side to make it slide at the bottom and bring the reading to 12.00 mA on the station.
- Tighten the nuts, by alternating upper bolt and lower bolt in order to maintain the adjustment.

GEOCLINE Biaxial

- Lightly loosen one of the nuts from the upper bolt.
- Adjust the fastening bolts from the lower bolt by screwing them or unscrewing them to bring the reading to 12.00 mA on the reading station (connected on channel Y).
- Tighten the nuts from the upper bolt simultaneously when the reading is close to 12.00 mA. When the position is correct, tighten the nuts.
- Adjust the mounting bracket while tapping on the side to make it slide at the bottom and bring the reading to 12.00 mA on the station (connected on channel X).
- Tighten the nuts, by alternating upper bolt and lower bolt in order to maintain the adjustment.

3.2 INITIAL MEASUREMENT

When the mounting bracket is firmly fixed into position, take an initial reading, which will be used as a reference for the measurement follow-up.

3.3 USING THE FLUKE 705 READING STATION

To proceed with a reading with the station, follow these steps:
See **Figure 4: Voltmeter Connection to GEOCLINE Sensors.**

- Connect the cords to the station (red cord in "+" terminal and black cord in "COM" terminal).
- Push and maintain the button "Source/Simulate/Measure" down while turning the dial to mA position, the reading station should go on, then release the button. The display should indicate 0.000 mA and should also indicate "Measure" and "Power Loop".
- Connect the black cord to the GEOCLINE wire "- sensor".
- Connect the red cord to the GEOCLINE wire "+ sensor".
- The reading station indicates the measured current.

4 MAINTENANCE AND TROUBLESHOOTING

4.1 ROUTINE MAINTENANCE

The routine maintenance procedures will help ensure that the GEOCLINE will provide many years of good functioning.

Keep the GEOCLINE clean and away from extremes of heat and cold. Dirt and extreme temperatures shorten the life of the seals and unnecessarily stress the electronic components. Keep the GEOCLINE out of direct sun, solar radiation may create internal temperatures considerably greater than the ambient temperature.

The tiltmeter is housed within a stainless steel cylinder. Therefore, it is protected against splashes, rainfall and hose-down conditions. However, it is not fully waterproof and it should never be submerged in water or any other liquid.

4.2 TROUBLESHOOTING

If there is no output when you have connected the GEOCLINE to the reading station, first check that the reading station has adequate power and is functioning properly. Then make sure all connectors are securely attached. Failure to obtain an output signal from the tiltmeter normally is the result of lack of power or a broken wire or connection.