

# Lily Borehole Tiltmeter

## Self-Leveling

The LILY Self-Leveling Borehole Tiltmeter is designed for volcanic and tectonic research and for monitoring of hydraulic fracturing and other subsurface processes in the oil and gas industry. LILY is the culmination of over 25 years of experience in the

fields of instrumentation and geophysics by the engineers and scientists at Applied Geomechanics. Its small diameter and high-pressure stainless steel housing give it ruggedness and versatility for demanding field projects.



### DESIGNED FOR VOLCANIC AND TECTONIC RESEARCH

The dual-axis tiltmeter senses angular movement in two orthogonal vertical planes using precision electrolytic tilt sensors. The digital electronics convert the tilt signals to an easily recorded RS485 (RS422) data stream consisting of tilt, azimuth, temperature, serial number and clock time. Data output in NMEA 0183 format is a standard feature.

The LILY tilt sensors can self-level on command through a range of  $\pm 10$  degrees and have  $< 5$  nanoradians resolution over a dynamic range of  $\pm 330$  microradians. LILY incorporates an innovative new design\* that achieves high mechanical stability, necessary for stable long-term measurements, at a much lower cost than was previously possible in instruments of this type.



## SPECIFICATIONS

<b>CHANNELS</b>	X tilt, Y tilt, azimuth, temperature
<b>RESOLUTION</b>	< 5 nanoradians
<b>REPEATABILITY</b>	Same as resolution under static conditions
<b>MEASUREMENT RANGE</b>	±330 μradians
<b>SELF-LEVELING RANGE</b>	±10 degrees
<b>LINEARITY</b>	0.2% of full span
<b>FREQ. RESPONSE</b>	< 1 Hz
<b>TEMPERATURE COEFS.</b>	Span: KS = +0.02%/°C, Zero: KZ = ±3 μradians/°C, typical. Smaller coefficients available at higher cost.
<b>AZIMUTH DETECTION</b>	On-board magnetic compass, 0° to 360° output
<b>SAMPLE RATES</b>	User-selectable from 10/second to 1/hour
<b>DATA STORAGE</b>	2 Megabytes of nonvolatile Flash memory (64,000 samples)
<b>DATA FORMATS</b>	Formats: NMEA XDR, Trimble proprietary, Ashtech compatible, Simple (x, y, temperature, serial no.)
<b>SERIAL OUTPUT</b>	RS485 (RS422). Baud rate: 9600, 19200 (default), 28800, 57600, 115200, 230400
<b>REAL-TIME CLOCK</b>	Present. Accuracy better than 10 minutes/year.
<b>POWER REQ'T'S.</b>	7 to 28 VDC @ 30 mA when sampling or transmitting, < 10 mA in sleep mode, sampling 1/minute, 250 mV peak-to-peak ripple max., reverse polarity protected
<b>SURGE PROTECTION</b>	All input and output lines are tranzorb protected.
<b>CONNECTIONS</b>	6-pin high-pressure neoprene connector standard, other connectors available
<b>ENVIRONMENTAL</b>	-25°C to +85°C operational, -30°C to +100°C storage. Pressure rating: 345 bars (5000 psi)
<b>DIMENSION &amp; WEIGHT</b>	51mm (2 inches) diameter x 915mm (36 inches); detachable handle is 150mm (6 inches) long. 4.5 kg (10 lb)
<b>MATERIALS</b>	304 stainless steel, nonmagnetic

Specifications are subject to change without notice as the result of ongoing development.

\* Patent pending

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