Tuff Tilt 420

4-20mA Precision Tiltmeters

The Tuff Tilt 420 combines precision, long-term stability and rugged durability in a compact and reliable instrument. The internal sensing element is a gravity referenced ceramic tilt sensor that delivers high dynamic range and the best resolution of any sensor in its class. Housed in a weatherproof enclosure, this tiltmeter may be used outdoors and in other wet environments.

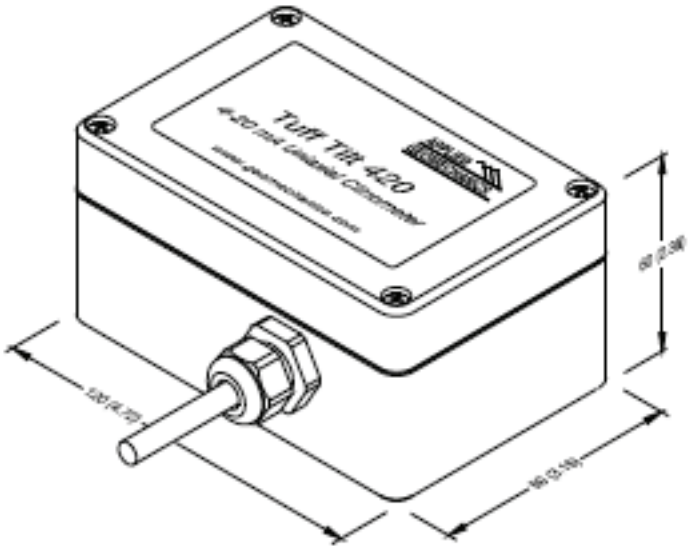
PRECISION, STABILITY AND DURABILITY

The Tuff Tilt 420 is current loop powered, so tilt measurements can be made over long cables using an economical 2-wire pair. As an added bonus, it also measures temperature using a built-in thermistor. Typical applications include:

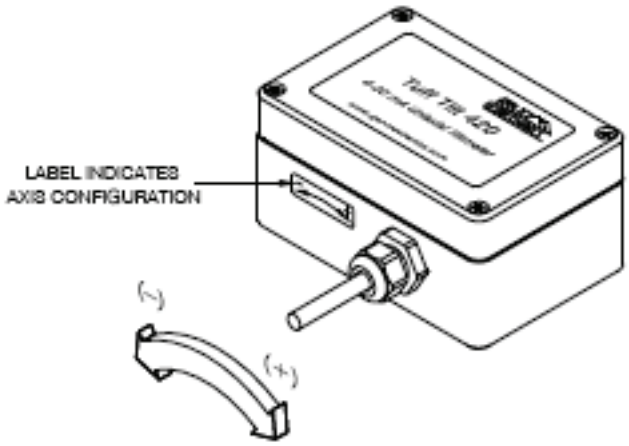
- Monitoring the performance of bridges, dams and other large structures; construction monitoring (standard version)
- Antenna leveling and zenith finding (high-gain version)
- Measuring the angular position of dam gates and other machinery (wide-angle version).

APPLIED GEOMECHANICS®

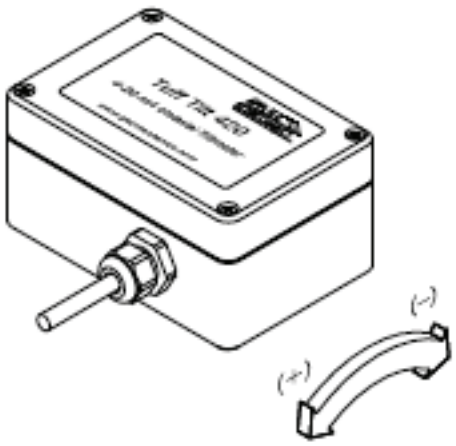
+1 415-364-3200 ● Geomechanics.com



DIMENSIONS: mm (in.)



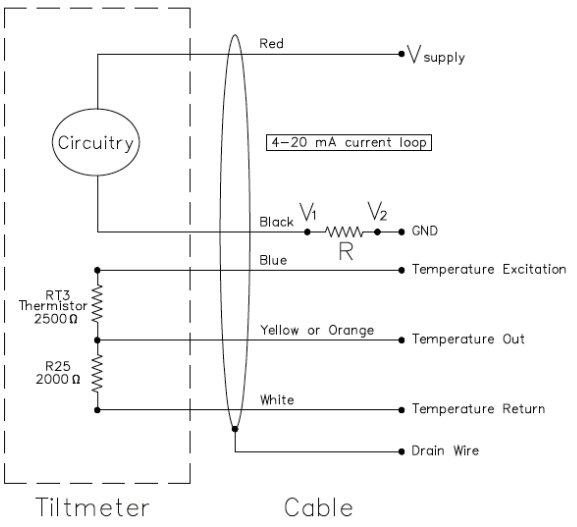
LONGITUDINAL



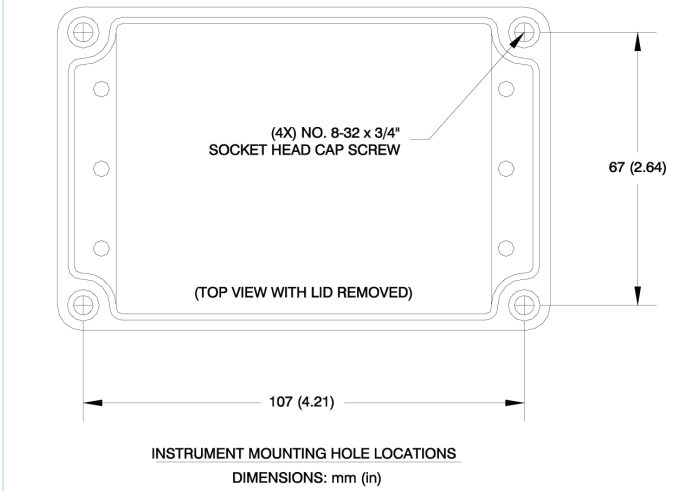
TRANSVERSE

WIRE COLOR (UNIAXIAL)	WIRE COLOR (BIAXIAL)	FUNCTION
Red	Red (X), Green (Y)	Loop Power (Vsupply)
Black	Black (X), White (Y)	Loop Return (Ground)
Blue	Blue	Temperature Excitation (up to 12V)
Yellow	Yellow	Temperature Out
White	No Connection	Temperature Return
Bare (Clear)	Bare (Clear)	Drain Wire (Shield)

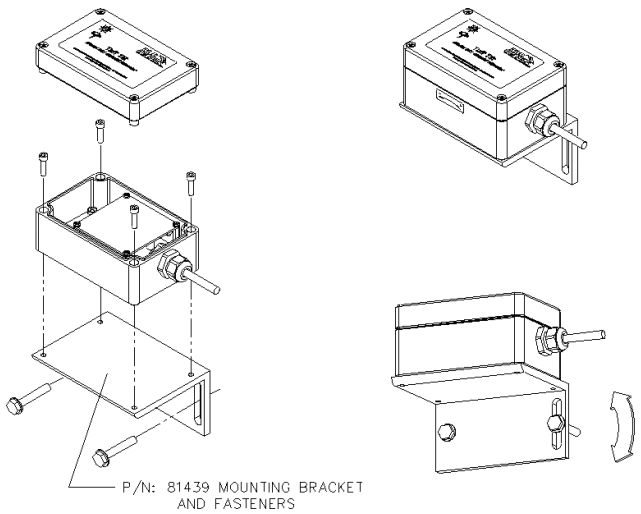
Uniaxial tiltmeters are available with longitudinal (Y) or transverse (X) tilt configuration. Biaxial tiltmeters include both tilt directions (X and Y).



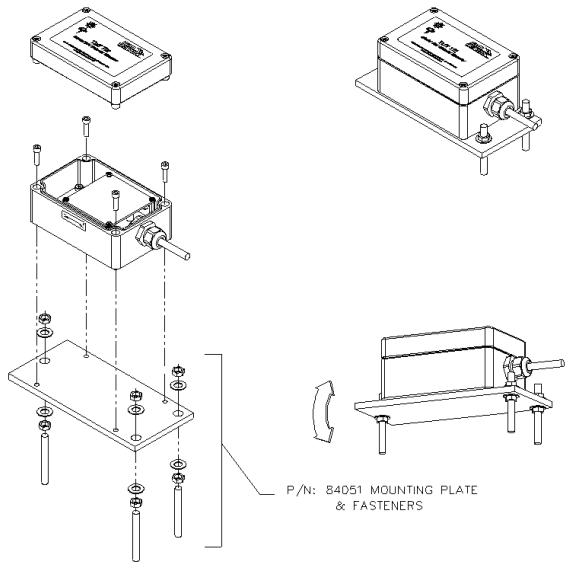
The Tuff Tilt 420 current signal is measured indirectly using a shunt resistor, R. Ohm's Law states that V1 – V2 = IR, where I is current in Amperes, R resistance in Ohms, and V1 and V2 the voltages measured on opposite sides of the shunt resistor. The diagram above is for uniaxial tiltmeters. See the table on the preceding page for biaxial tiltmeters. Temperature measurement using the onboard thermistor is diagrammed below.



Mounting holes are accessed by removing lid of tiltmeter. Use 8-32 or 4 mm screws.

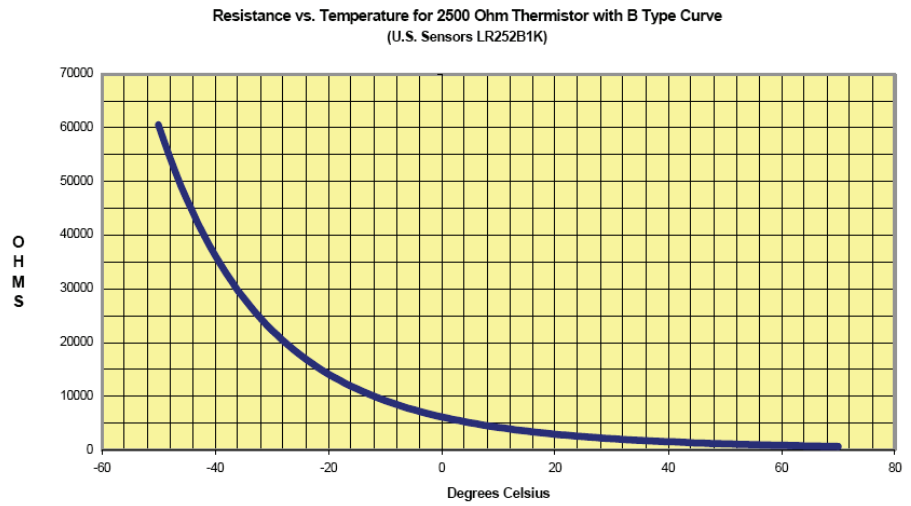


For mounting on vertical surfaces: Order the 81439 Mounting Bracket Assembly, which includes complete hardware.



For mounting on horizontal surfaces: Screw the tiltmeter directly to the surface, or order the 84051 Mounting Plate Assembly, which includes complete hardware.

	HIGH-GAIN VERSION	STANDARD VERSION	WIDE-ANGLE VERSION
ANGULAR RANGE	±0.5 degree (1 degree span)	±3 degrees (6 degrees span)	±50 degrees* (100 deg. span)
SCALE FACTOR	0.0625°/ mA typical	0.375°/ mA typical	6.25°/ mA typical
LINEARITY	1% of full span	1% of half span, 2.5% of full span	1.2% of half span, 7.5% of full span
RESOLUTION	<0.0001 degree (<1.75 µradians)	0.0006 degree (10 µradians)	<0.01 degree
REPEATABILITY	<0.0002 degree	0.001 degree	0.02 degree
NATURAL FREQUENCY	3 Hz	3 Hz	7 Hz (critically damped)
TILT OUTPUT	4-20 mA two-wire current loop		
TIME CONSTANT, T	150 msec; output is proportional to 1 - $e^{-t/T}$ where t = time in seconds		
NATURAL FREQUENCY	10 Hz; available with viscous sensor to damp vibrations		
TEMPERATURE COEF.	Scale factor: K_S < 0.04%/°C typ. Zero shift: K_Z = ±0.0002 degree/°C typ.		K_S < 0.1%/°C typ. K_Z = ±0.002 degree/°C typ.
POWER REQUIREMENT, VS	(0.02 Ampere x R + 10 VDC) < Vs < 29 VDC where R is the resistance of the shunt resistor and loop wiring in Ohms		
TEMPERATURE OUTPUT	Temperature is measured with a 2500 Ohm thermistor, −50 to +150°C range		
ENVIRONMENTAL	−40° to +85°C operating and storage		
ENCLOSURE & MOUNTING	Painted, die-cast aluminum box, 120 x 80 x 60 mm. Remove lid to access four mounting holes.		
CABLE	3m (10 ft), 5-conductor + one overall shield, PVC jacket, tinned ends		
WEIGHT	1.1 lb (500 g)		



T = 1/[A + B Ln(RT3) + C Ln(RT3)^3 + D Ln(RT3)^5] – 273.15
where T is in degrees Celsius and RT3 = thermistor resistance.

A = 7.34862E-04, B = 3.38205E-04
C = -1.30862E-07, D = 1.21751E-09

ORDER CODES:

TuffTilt 420– [ ][ ]

H	**H**igh gain
L	**S**tandard gain / **W**ide angle
S	**L**ongitudinal
T	**T**ransverse
W	**B**iaxial
B	

USEFUL ACCESSORIES:

81439	Vertical mounting bracket
84051	Horizontal mounting plate
70369	Additional cable, specify length
62204	6-pin in-line receptacle
62202	6-socket in-line plug

APPLIED GEOMECHANICS , INC.
140 Chestnut St.
San Francisco, CA 94111
T: +1-415-364-3200
F: +1-415-861-1448
geomechanics.com

A CARBO Company