



## ENSESA, S.A. DE C.V.

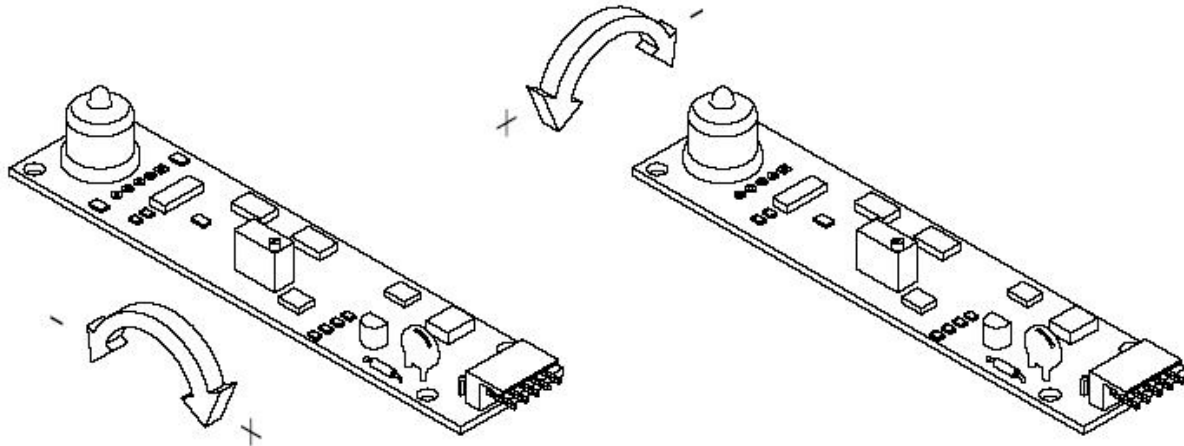
Los clinómetros uniaxial **Tulip** 4-20mA son instrumentos compactos y exactos para medir la posición angular donde está limitado el espacio. Utilícelos en cubiertas de presión, herramientas de registro de pozo o en cualquier máquina o estructura. El sensor electrolítico de inclinación del **Tulip** no tiene ninguna parte mecánica en movimiento que se rompan o queden inutilizadas, y es referenciado a la gravedad. Usted puede instalar su clinómetro dondequiera, sin la necesidad de palancas o de accesorios complicados. El **Tulip** es accionado por un lazo de corriente, así que las mediciones se pueden hacer sobre largas longitudes de cable usando un económico par de dos hilos. Disponible en versiones vertical y horizontal, y la versión horizontal hace mediciones longitudinales o rotación transversal (véase el dibujo) para darle flexibilidad máxima al diseñarlo en su sistema. Como beneficio adicional, el **Tulip** mide temperatura usando un termistor incorporado.



	High-Gain Version	Standard Version	Wide-Angle Version
ANGULAR RANGE	±10 degrees (20 degree span)	±25 degrees (50 degree span)	±50 degrees* (100 deg. span)
SCALE FACTOR	1.25°/ mA typical	3.125°/ 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	0.005 degree	0.01 degree	0.02 degree
REPEATABILITY	0.01 degree.	0.02 degree	< 0.04 degree
HYSTERESIS	< 0.02 degree	< 0.02 degree	< 0.04 degree
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.	Span: +0.03%/°C, Zero: 10-20 arc sec/°C typical		
POWER REQUIREMENT, $V_s$	(0.02 Ampere x $R$ + 10 VDC) < $V_s$ < 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		
DIMENSIONS	See drawing. An 18-inch (45 cm) cable is supplied with each <i>Tulip</i> .		
WEIGHT	0.5 oz (15 g)		
MATERIALS	Liquid-filled glass or metal sensor, fiberglass PC board		

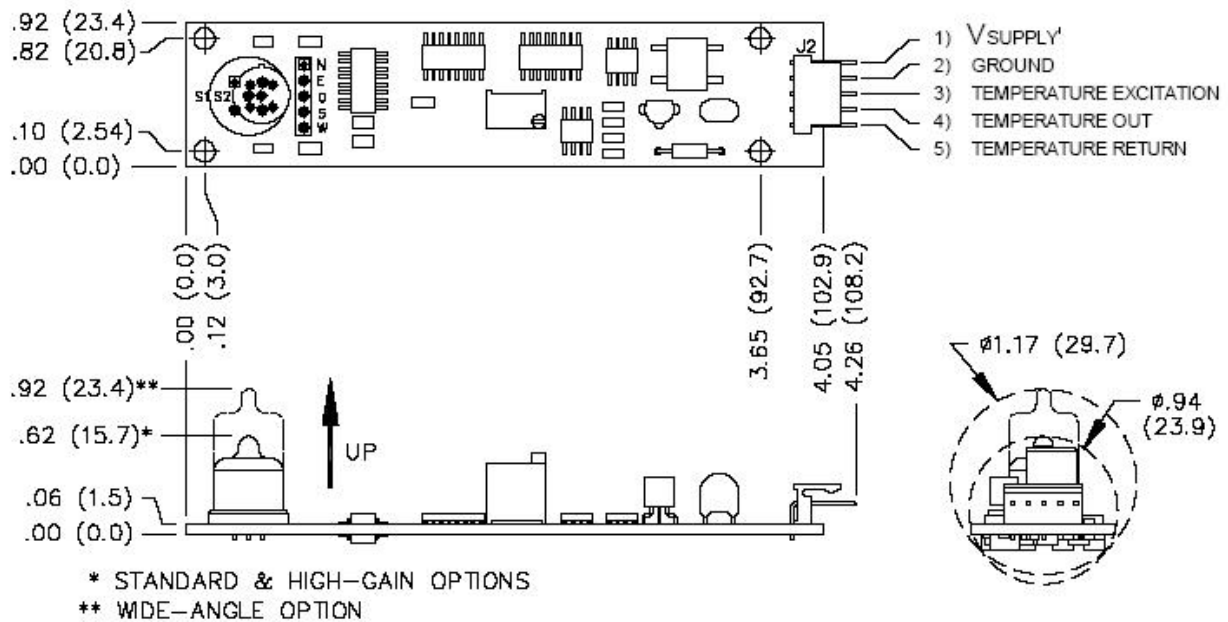
<i>Tulip</i> Order Numbers. Add VISCDAMP to end of number for viscously damped sensor.				
Horizontal	Transverse Tilt	Longitudinal Tilt	Vertical	
High Gain	98006-01	98006-04	High Gain	98007-01
Standard	98006-02	98006-05	Standard	98007-02
Wide Angle	98006-03	98006-06	Wide Angle	98007-03

## TULIP 4-20 mA UNIAXIAL CLINOMETER HORIZONTAL VERSION

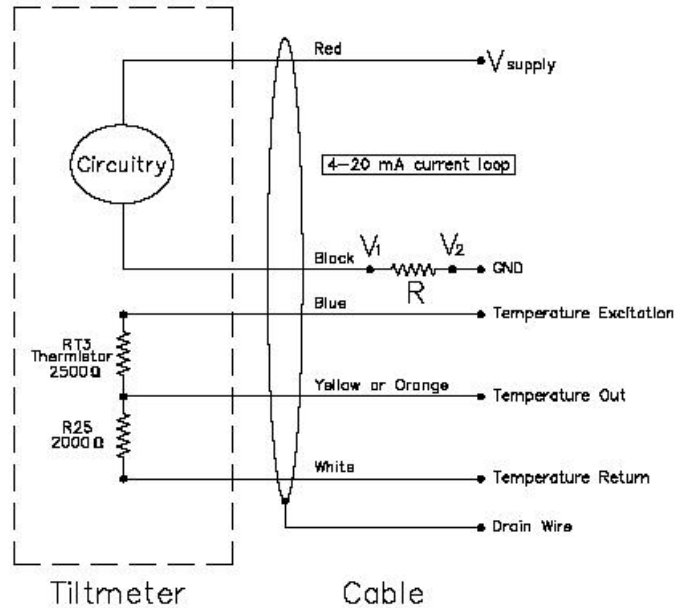


LONGITUDINAL TILT OPTION

TRANSVERSE TILT OPTION

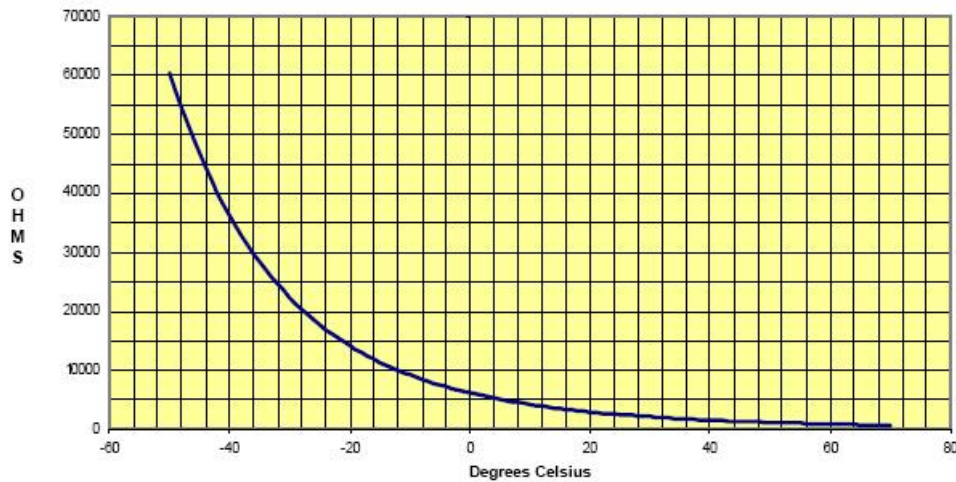






**Tulip's** current signal is measured indirectly using a shunt resistor,  $R$ . Ohm's Law states that  $V_1 - V_2 = IR$ , where  $I$  is current in Amperes,  $R$  resistance in Ohms, and  $V_1$  and  $V_2$  the voltages measured on opposite sides of the shunt resistor

Resistance vs. Temperature for 2500 Ohm Thermistor with B Type Curve  
(U.S. Sensors LR252B1K)



$$T = 1/[A + B \ln(RT3) + C \ln(RT3)^3 + D \ln(RT3)^5] - 273.15$$

where  $T$  is in degrees Celsius and  $RT3$  = thermistor resistance.

$$A = 7.34862E-04$$

$$B = 3.38205E-04$$

$$C = -1.30862E-07$$

$$D = 1.21751E-09$$