

SERIE TSM-xxx - one or dual-axis inclinometer (HIGH ACCURACY)

Features

- Single / Dual-Axis Inclinometer
- Measuring Range : $\pm 1 \sim \pm 90^\circ$ optional
- Wide voltage input: 9~36V
- Output interface : 4-20mA / 0-5 Vcc / Rs485 / CanBus
- Wide temperature working: $-40 \sim +85^\circ\text{C}$
- IP67 protection class
- Highly anti-vibration performance $>2000g$
- Resolution: 0.001°
- Small Volume : L90×W50×H33mm (customized)



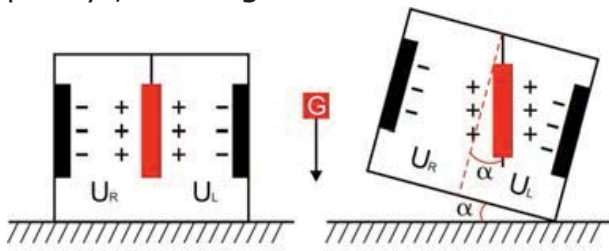
Application:

- Engineering vehicles automatic leveling
- Bridge & dam detection, geological equipment inclined monitoring
- Aerial platform vehicle, lifter safety & protection, directional satellite communications antenna
- Medical facilities angle control
- Underground drill posture navigation, railway gauging rule, gauge equipment leveling
- Mining machinery, oil-well drilling equipment

	TSM-1x-10	TSM-1x-30	TSM-1x-60	TSM-1x-90	UNIT
Measuring rang	± 10	± 30	± 60	± 90	°
Measuring axis	1-2	1-2	1-2	1-2	
Resolution	0,001	0,001	0,001	0,001	°
Absolute accuracy	0,005	0,01	0,02	0,05	°
Zero temp. coefficient -40~85°	± 0.002	± 0.002	± 0.002	± 0.002	°/C
Sensitivity Temp. coeff -40~85°	=50	=50	=50	=100	ppm/?
Response time	0.05	0.05	0.05	0.05	Seg.
Output	Output mode RS232/RS485/TTL / Can 0...5 Vcc / 4...20 mA				
Power supply	9...36 Vdc				
Working temperature	-40...+85				°/C
Store temperature	-50...+100				°/C
Electromagnetic compatibility	According to EN61000 and GBT17626				
MTBF	=50000 hours/times				
Insulation Resistance	=100M				
Shockproof	100g@11ms、3Times/Axis(half sinusold))				
Anti-vibration	10grms、10~1000Hz				
Protection class	IP67				
Cables	Standard 1M length、wearproof、grease proofing、widetemperature、Shielded cables4*0.4mm2				
Weight	150g(without cable)				

Working Principle

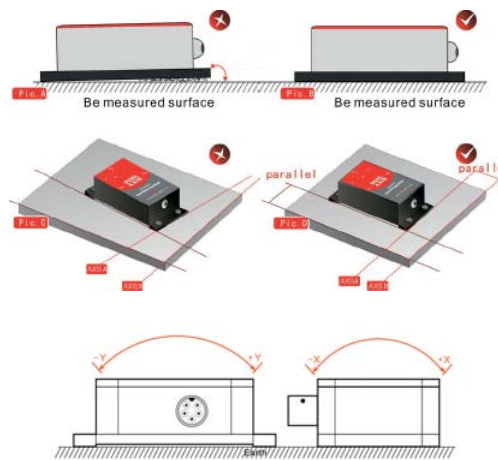
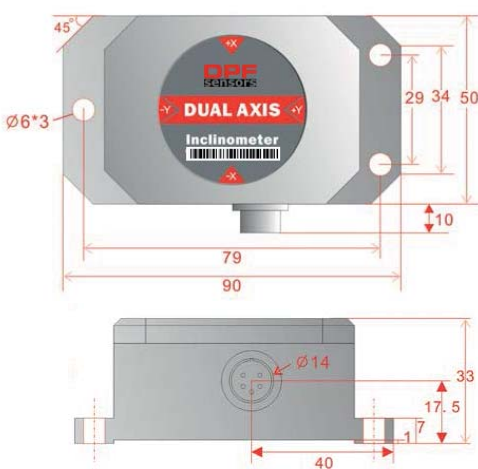
Adopt the European import of core control unit, using the capacitive micro pendulum principle and the earth gravity principle, when the the inclination unit is tilted, the Earth's gravity on the corresponding pendulum will produce a component of gravity, corresponding to the electric capacity will change, , by enlarge the amount of electric capacity , filtering and after conversion then get the inclination.



U_R, U_L Respectively is the pendulum left plate and the right plate corresponding to their respective voltage between the electrodes, when the tilt sensor is tilted. U_R, U_L Will change according to certain rules, so $f(U_R, U_L)$ On the inclination of α function:

$$\alpha = f(U_R, U_L)$$

mechanical characteristics



Angle output calculation formula

Angle = (Output current - Zero position current) ÷ Angle sensitivity
 - Angle sensitivity = output current range ÷ Angle measuring range
 E.g : TST-12/30/A ($\pm 30^\circ$ Measuring range 16mA output current range)
 Angle sensitivity = $16 \div 60 = 0.266666 \text{ mA}/^\circ$

Ordering information:

TSM	X	-XX	X
	1: 1 AXIS	10 (10°)	A (4...20 MA)
	2: 2 AXIS	30 (30°)	B (0...5 VDC)
		60 (60°)	C (RS232)
		90 (90°)	M (MODBUS)
			CB (CANBUS)
		XX (OTHER RANGE)	

*For 1 Axis assembly to specify A or B (standard)

** if you need vertical mounting, add VER

E.g : TSC12-30-A, Dual-axis/Standard/ $\pm 30^\circ$ Measuring range/4-20mA output current

TSM is a high accuracy single-axis inclinometer, output adopt the standard industry electronic interface 4-20mA, 0-5 Vcc, RS485, or CAN 2.0B. The product uses the latest MEMS high technology for production, made precise compensation and correction to temperature error and nonlinearity error, small measuring range the highest accurate up to 0.003° (bigger measuring range index, please refer to product technical data), TSM inclinometer use the dynamic zero test compensation technology.

