TST TRAFFIC SMARTCITY TECHNOLOGY

iTilt

LoRaWAN Tilt Sensor

iTILT Sensor

LoRaWAN

TST iTILT is a precision, digital inclinometer that monitors both single-axis (±180°) and dual-axis (±90°) movements. The iTILT sensor uses gravity stimulus and a MEMS accelerometer sensing element. The MEMS accelerometer uses a spring-loaded component with a fixed pick-off finger structure. The spring determines how far the object moves when subjected to force. This structure responds to dynamic forces associated with acceleration and to static forces, such as gravity.

LoRa

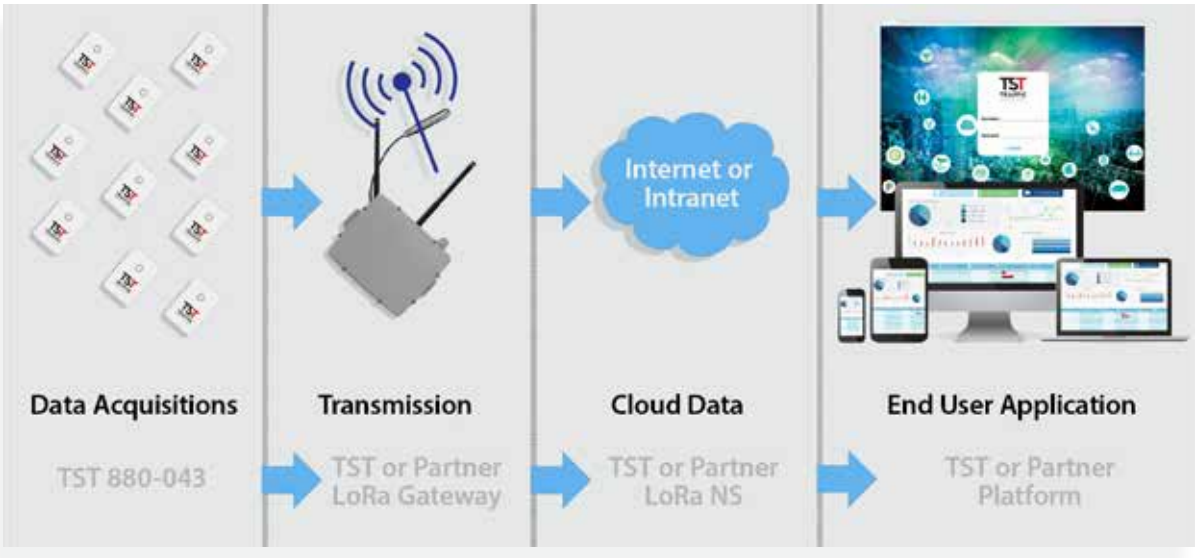
Typical Applications Include:

- Solar power plant
- Aerial equipment monitoring
- Bridge
- Street Furniture
- Buildings

Product Highlights

- Accurate, digital inclinometer that accommodates both single-axis (±180°) and dual-axis (±90°)operation.
- Configurable operating parameters include sample rate, power management, digital filtering, auxiliary analog and digital output, offset/ null adjustment, and self-test for sensor mechanical structure.
- Cross-threshold report, plus periodic report every 2 hours (the threshold and the periodic report cycle are both user-configurable)
- OTA (Over The Air) firmware upgrade, including upgrade loader and application images
- Low power consumption, 5 – 10 years of battery operational life with 2 x AA Li-SOCl2 Battery
- Up to 5km reach in NLoS (Non-Line-of-Sight) and up to 18km LoS (Line-of-Sight) environments
- Operates over a temperature range of -40°C to +125°C.
- Analog and digital interface for external sensor connectivity and pulse counting (MPI)
- Optional DC 5V power source
- Integrated internal antenna, or optional external SMA/IPEX antenna
- IP67 enclosure rating

Application Architecture and Sample Applications



Specifications

iTILT Sensor	
Parameter	**Value**
Dual-Axis	Horizontal operation, ±90°
Single-Axis	Vertical operation, ±180°
High Accuracy	0.1°
Digital Inclination Data	0.025° resolution
Digital Acceleration Data	0.244 mg resolution
ACC Measurement Range	±1.7 g
Powered Shock Survivability	3500 g
Data Report	Cross-threshold report, plus periodic report every 2 hours (the threshold and the periodic report cycle are both user-configurable)

Wireless	
ISM Band	EU 863 – 870MHz US 902 – 928MHz China 779 – 787MHz EU 433MHz AS 923MHz CN 470 – 510MHz
Maximum Link Budget	168dB
Distance	Up to 5km NLOS; up to 18km LOS
Antenna	Integrated internal antenna or external 1/2 wavelength whip antenna (SMA)

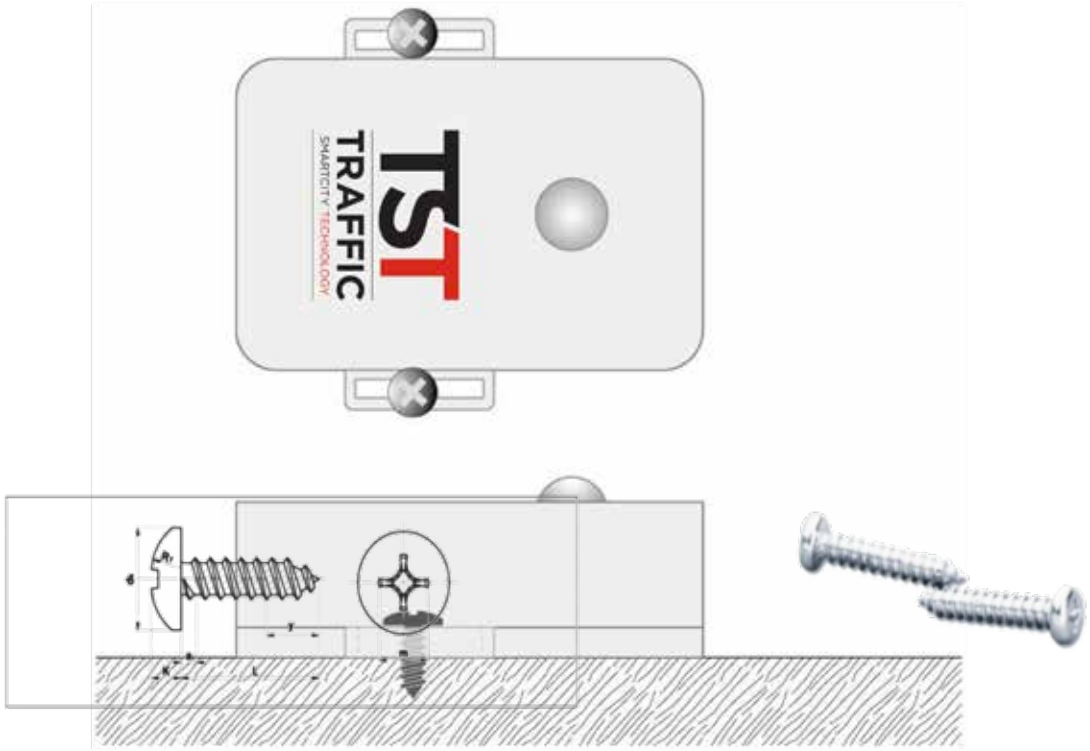
Mechanical	
Dimension	60mm x 100mm x 30mm (WxS8800) 96mm x 86.5mm x 25.8mm Ø25mm (Current Transformer sensor)
IP rating	IP65 or IP67 (WxS8800)
Operating Temperature	-40ºC to +85ºC
Cable length	0.5 meter
Total Weight	120 g

Electrical	
Supply Voltage	3.0 – 3.8V DC
Power Type	Replaceable 1 or 2 AA 3.6V Li-SOCI2 Battery; DC 4.5V – 12V
Battery Life	5 – 10 years (assume one motion event one day)

Compliance/Certification	
LoRa Alliance	LoRaWAN 1.0.2
FC IC CE RoHS	FCC(America): 2AO7W-WXS8000,
	IC(Canada): 23701-WXS8000
	CE(European Union) B1810246
	ROHS(European Union): R2BJ180927F0664E

Installation Guide

Below diagram shows the general installation guide for TST iTILT, it can be installed on any flat and solid surface, the lid is contacted with the surface and fixed via 2 self-tapping screws:



Below is the recommendation of the self-tapping screw and its sizes:

		ST2.2	ST2.9	ST3.5	ST4.2	ST4.8	ST5.5	ST6.3
dk	**min**	3.7	5.3	6.64	7.64	9.14	10.57	11.57
K	**min**	1.4	2.15	2.35	2.8	3.4	3.7	4.3
m		1.9	3	3.9	4.4	4.9	6.4	6.9
L		4.5 - 100mm						

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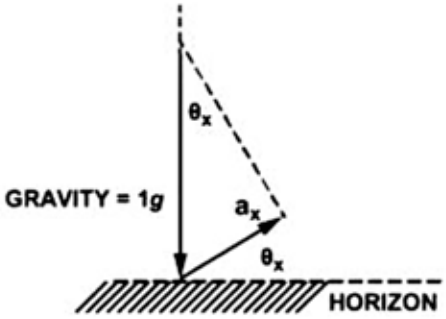
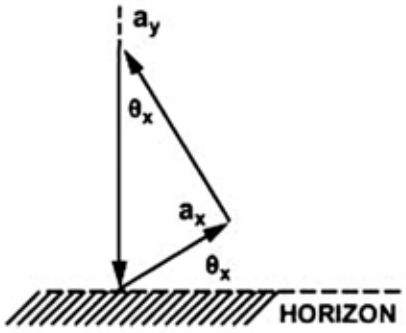
Sensor principle

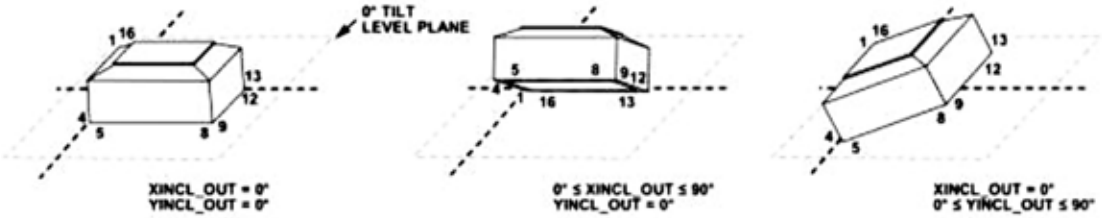
The tilt sensing system uses gravity as its only stimulus, and a MEMS accelerometer as its sensing element. MEMS accelerometers typically employ a tiny, spring-loaded structure that is interlaced with a fixed pick-off finger structure. The spring constant of the floating structure determines how far it moves when subjected to a force. This structure responds to dynamic forces associated with acceleration and to static forces, such as gravity.



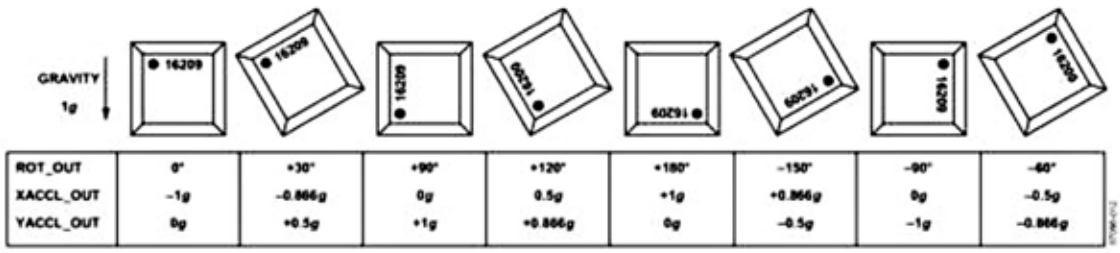
Single-Axis Tilt Theory Diagram



Dual-Axis Tilt Theory Diagram



Horizontal Incline Angle Orientation



ROT_OUT	0°	+30°	+90°	+120°	+180°	−150°	−90°	−60°
XACCL_OUT	−1g	−0.866g	0g	0.5g	+1g	+0.866g	0g	−0.5g
YACCL_OUT	0g	+0.5g	+1g	+0.866g	0g	−0.5g	−1g	−0.866g

Vertical Angle Orientation

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ISO 9001 Quality
ISO 45001 OH&S
ISO 14001 Environmental

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