SPEC SHEET

Wireless Laser + Tiltmeter

LS-G6-LAS-TIL90-MON

2-IN-1 WIRELESS LASER DISTANCE METER AND TILTMETER

The Trimble® LaserTilt90 is a 2-in-1 laser distance meter and tiltmeter. The laser measures the relative distance to a reference point that can be either natural surfaces or target foils. Meanwhile, the tiltmeter provides measurements of changes from the vertical level, either on the ground or in structures. This 2-in-1 wireless sensor is designed to provide robust data when monitoring inclinations, movements and differential settlements of slopes or infrastructures.

The LaserTilt90 can be easily located along the convergence cross sections up to the excavation front or until the measured relative displacements are stabilized when the required frequency of measurements is reduced.

It can also be used when permanent monitoring is required. The wireless sensor can also measure deformations in underground excavations and mining without causing work disruptions and delays.

Long-range and low-power

The LaserTilt90 is capable of transmitting data via long-range radio to a gateway connected to the Internet up to 9 miles/ 15 km away. One gateway can also support dozens of data loggers in the same network, depending on the reporting period, through a star or tree network topology.

In terms of energy consumption, the LaserTilt90 is an autonomous battery-powered device with C-size batteries that can last up to 10 years with minimal to zero maintenance required. It is IP68 certified and operating temperature
from 0 °C to 50 °C

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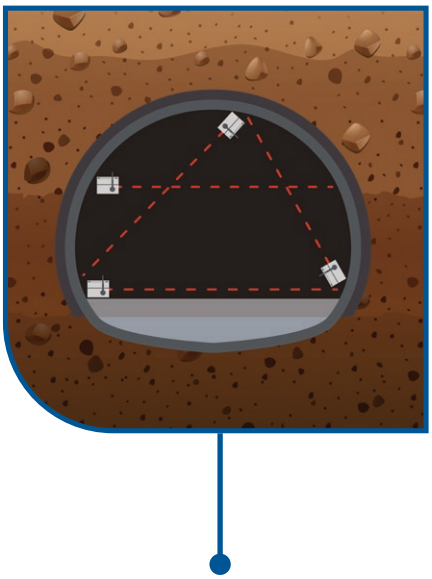
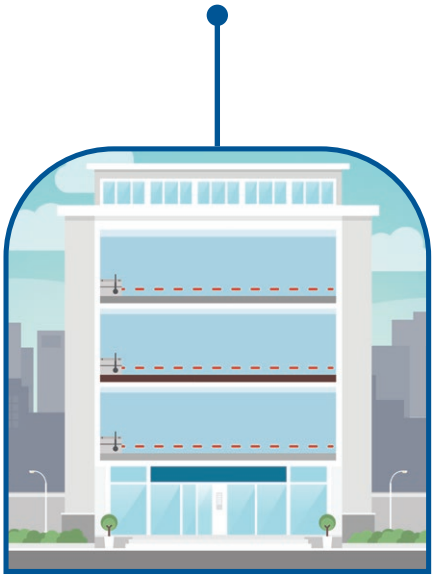
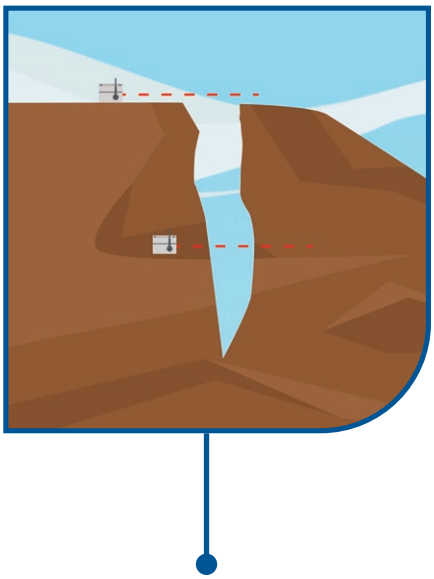


Tunnel and underground convergence monitoring

Monitoring displacements in structure and buildings





Remote monitoring of slope stability

TECHNICAL SPECIFICATIONS

GENERAL	
Sensor type	2-in-1 Laser Distance Meter + Tiltmeter
Reporting period	Selectable from: 30 s 1, 2, 5, 10, 15, 30 min 1, 2, 4, 6, 12, 24 h
Time synchronization discipline by radio	Better than ±30 seconds.
Battery type	2 x 3.6 V C-Size user-replaceable, high energy density batteries
Interfaces	Internal mini USB
Device configuration	Trimble Geotech app for Android
App advanced functionalities	Laser pointing mode. Tiltmeter calibration parameters check using the app. Radio signal coverage tests for easy installation.

LASER DISTANCE METER	
Sensor	Visible Laser Class II with 655 nm
Laser power	0.75 to 0.95 mW
Resolution	0.1 mm
Repeatability (1 sigma)	0.15 mm
Measuring range at favorable conditions	0.05 to 150 m
Typical measuring accuracy	±1 mm
Time required for a reading	Up to 4 seconds, depending on distance.

Accuracy	in favorable conditions[1]	in unfavorable conditions[2]
@ 1 m	±1 mm	±2 mm
@ 10 m	±1 mm	±2 mm
@ 20 m	±1.5 mm	±3 mm
@ 50 m	±4 mm	±7 mm
@ 100 m	±9 mm	±15 mm
@ 150 m	±16 mm	Not applicable
Signal strength	Signal strength and gain are transmitted with each laser measurement. It can be used for maintenance purposes.	

TILTMETER	
Sensor	3-axis MEMS accelerometer
Range[3]	± 90°
Axes	3-axis inclination measurement with respect to gravity's direction. Reports the two axes of rotation from the horizontal plane in any orientation.
Resolution	0.0001°
Repeatability	<0.0003°
Typical measuring accuracy	±1 mm
Time required for a reading	Up to 4 seconds, depending on distance.
Accuracy *f*(a)	
Angle (a)	Accuracy
± 2º	± 0.0025°
± 4°	± 0.005°
± 15°	± 0.013°
± 45°	± 0.08°
± 85°	± 0.23°

Trimble

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FEATURES

- 2-in-1 laser meter + tiltmeter.
- 3-axis inclination with respect to gravity's direction and a range of ± 90°.
- Accurate distance measurement through a visible Laser Class II with 655 nm.
- Internal temperature (accuracy: ±1 °C), signal strength and gain collected and transmitted at each reading.
- Robust, compact design and IP68 grade weather-proof box.
- Long battery life (>10 years @1h sampling rate).
- Long range communications through LoRa communications.
- User-friendly Trimble Geotech app for Android™ included.

ADVANTAGES

- Suitable for unattended, large scale projects.
- Very low maintenance equipment due to its robustness and low-power consumption.
- Provides complementary data for existing geospatial monitoring when high precision and robustness is needed.
- Easy configuration through the Android mobile application.
- Customer support from a expert team of geotechnical monitoring.
- Pioneer company in the field, long history in monitoring large-scale civil infrastructure.

APPLICATIONS

Structural health

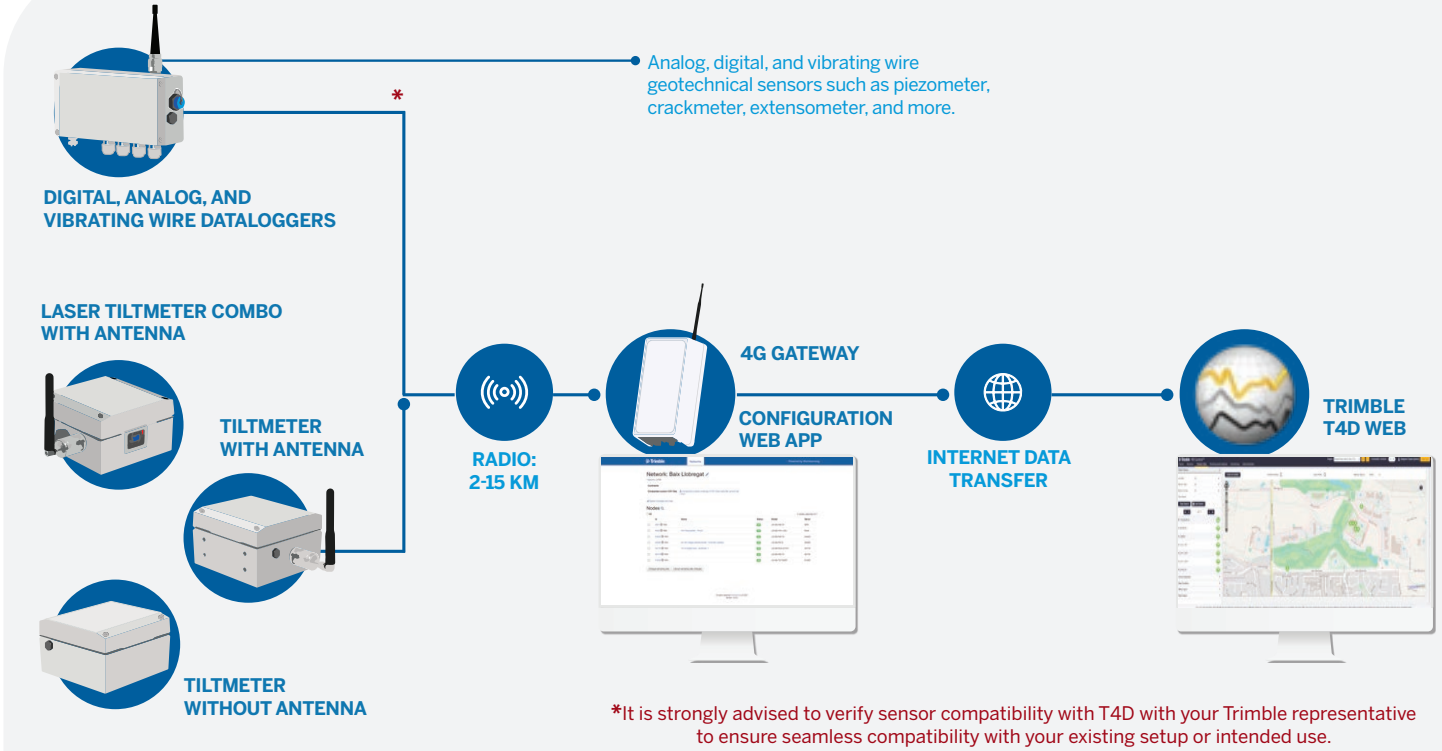
- Convergence monitoring for tunnels, shafts and galleries.
- Static deflections of piles, piers and decks of bridges and other structures.

Geotechnical monitoring

- Slope movements in landslides, embankments.
- Ground movements in underground excavations.

IoT-based Geotechnical Monitoring

SYSTEM INSTALLATION



*It is strongly advised to verify sensor compatibility with T4D with your Trimble representative to ensure seamless compatibility with your existing setup or intended use.

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TILTMETER	
Offset temperature dependency	± 0.002°/°C
Stability @ 14 h	< 0.003°
Time required for a reading	9.6 s
Measure of dispersion	Standard deviation of the set of measurements collected during the reading and transmitted with each tilt measurement. It can be used to filter noisy data.
Temperature sensor resolution	0.1 °C

MECHANICAL	
Box dimensions (W x L x H)	100 x 100 x 61 mm
Overall dimensions	150 x 120 x 61 mm (excluding antenna)
Operating temperature	-10 °C to +50 °C
Storage temperature	-25 °C to +70 °C
Weather protection	IP68 (at 2 m for 2 hours)
Weight (excluding batteries)	841 g
External antenna	100 mm length (including connector)
Mounting options	Clearance holes for M4 hexagon socket head cap screws in bottom. Blind holes for M5 screws on the lateral side.
External Port	Mini USB port for configuration and data access; can also be used to power the node.
Box material	Aluminium alloy
Batteries	ISO 9022-3 compliant. Method 36, Severity 05 (0.15mm, 10Hz..55Hz)
Memory	
Memory structure	Circular buffer
Maximum memory records	100,000 readings including time, distance and 3 axis tiltmeter measurements

RADIO SPECIFICATIONS	
Radio band	ISM sub 1 GHz
Operating frequency bands	Adjustable
Bidirectional communications	Remote sampling rate change / Clock synchronization
Maximum link budget	151 dB / 157 dB
Configuration	LoRa Star / LoRa Tree
Radio range[4]	
Range open field	15 km
Range city street	4 km
Range manhole in a city street	2 km
Tunnel	4 km

BATTERY LIFE ESTIMATIONS[5]

Distance		**25 m**	**65 m**
Reporting period	5 min	6 months	1.8 years
	1 h	5.1 years	10.2 years
	6 h	12 years	14.3 years

ACCESSORIES Other mounting brackets and accessories available upon request. Magnetic mounting kits are undergoing development.	
LS-ACC-CELL-1C	Saft LSH 14 C-size spiral cell (5.8 Ah).
LS-ACC-IN15-VP[6]	Mounting plate for vertical mounting; attachment option: anchor rods.
LS-ACC-IN15-HP[6]	Versatile plate for horizontal surface mounting; attachment option: anchor rods or glue; includes a threaded hole available for installing a monitoring prism or a button head screw for precise levelling.
LS-ACC-LAS-AP	Adjustable mounting plate for vertical surface; attachment option: anchor rods. This support allows limited rotation in two axis with respect to the reference surface. This support is proper for fine aiming of the laser beam.
LS-ACC-LAS-SB[7]	Swivel mounting bracket; attachment option: pole fixing 50 mm U-bolts, anchor rods or on a convergence bolt with G 3/8" male thread. The swivel mounting bracket allows swivelling around the vertical axis (+/- 90°) and a minor rotation of the enclosure on the plate (+/- 3°).
LS-ACC-ANC-H[8]	Kit of 3 anchor rods for injection. M8, 110 mm. Length, nuts & washers included.
LS-ACC-MAG[9]	Kit of 3 magnets, Ø 32 mm, strength approx. 30 kg, screws included.
WS-ACC-LAS-TG	Laser target rotatable and swivelable 360° compatible with convergence bolt G 3/8" male thread, M8 anchor rods and M5 magnets.

Accessories not ending with "MON" are not part of the Trimble portfolio. These can be purchased directly from Worldsensing.

1 On natural objects. Low target illumination (<3K lx), moderate temperatures.
2 On natural objects. High target illumination (3K lx), full specified operating temperature range
3 The recommended measuring range is ±85°. Outside of this range, the margin of error increases. However, when one of the axes is close to 90°, the other axis will be close to 0° and measuring the same inclination.
4 The distances have been tested and have been accomplished in actual projects using the standard antenna. However, radio range depends on the environment so these distances are only indicative. Consult with us for your application.
5 Typical Europe radio configuration. Spreading factor 9, radio transmit power 14dBm. Considering laboratory conditions. Consumption varies depending on the sensor used, sampling rate and environmental and wireless network conditions.
Battery life estimations using recommended Saft batteries LSH14, based on the lifetime mathematical model using Barcelona weather profile. Average values provided.
6 The laser beam cannot be aimed using this mounting plate because the node is fixed.
7 The swivel mounting bracket allows swivelling and rotation but these degrees of freedom, even if the bracket is fixed in place with screws or fasteners, can aversely affect the inclination measurement specifications of the whole system.
8 The kit can be used to fix the following mounting kits: LS-ACC-IN15-HP, LS-ACC-IN15-VP, LS-ACC-LAS-AP, LS-ACC-LAS-SB.
9 The kit of 3 magnets can be used to fix the LS-ACC-IN15-VP mounting plate.

Contact your local Authorized Trimble Distribution Partner for more information

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