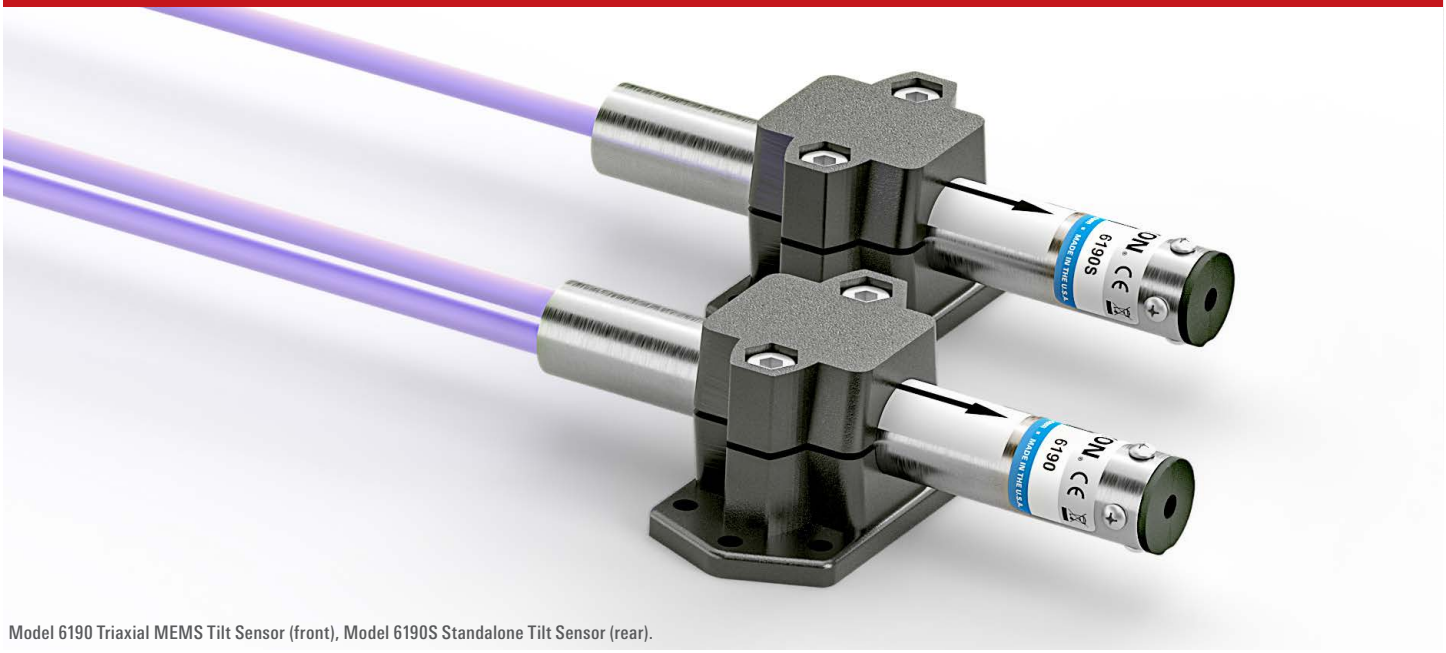
TILT SENSOR (TRIAXIAL MEMS)

GEOKON®

MODEL 6190



Model 6190 Triaxial MEMS Tilt Sensor (front), Model 6190S Standalone Tilt Sensor (rear).

APPLICATIONS

The Model 6190 MEMS Tilt Sensors are designed to measure tilt on or in structures including:

- Buildings
- Dams
- Embankments
- Slopes
- Retaining walls
- Open pits
- Railroad tracks



GeoNet Addressable Data Logger

OPERATING PRINCIPLE

The basic principal of operation is the utilization of MEMS (Micro-Electro-Mechanical Systems) tilt sensors to make accurate measurements of inclination at discrete points where each Tilt Sensor is located.

The Model 6190 Tilt Sensor consists of a Triaxial MEMS Tilt Sensor, installed inside a stainless steel housing and includes an adjustable bracket for mounting. The bracket is bolted to the structure using the supplied hardware, which includes two ⅜" drop-in anchors.

Sensors can be ordered as standalone units or combined into strings. Standalone sensors are shipped with a customer specified length of cable and bare leads. For sensor strings, each sensor is supplied with a pair of interconnecting cables, one with a male connector and the other with a female connector. When tilt string sensor spacing exceeds 1.5 m, extension cables (with requisite connectors) are required.

A four-wire bus cable connects the sensor/string to the chosen readout (PC, data logger, SCADA system, etc.) via stripped and tinned conductors.

Each sensor is individually serialized and calibrated. A calibration report showing the relationship between sensor output and inclination is provided with each sensor. Sensor output consists of temperature and calibrated tilt readings, which can be easily imported into MS Excel, or any data visualization software, without the need to convert raw data into engineering units.

ADVANTAGES

MEMS tilt sensors are low-cost, robust, and virtually immune to shock loading. They operate over a wide angular range, with high sensitivity and excellent long-term stability.

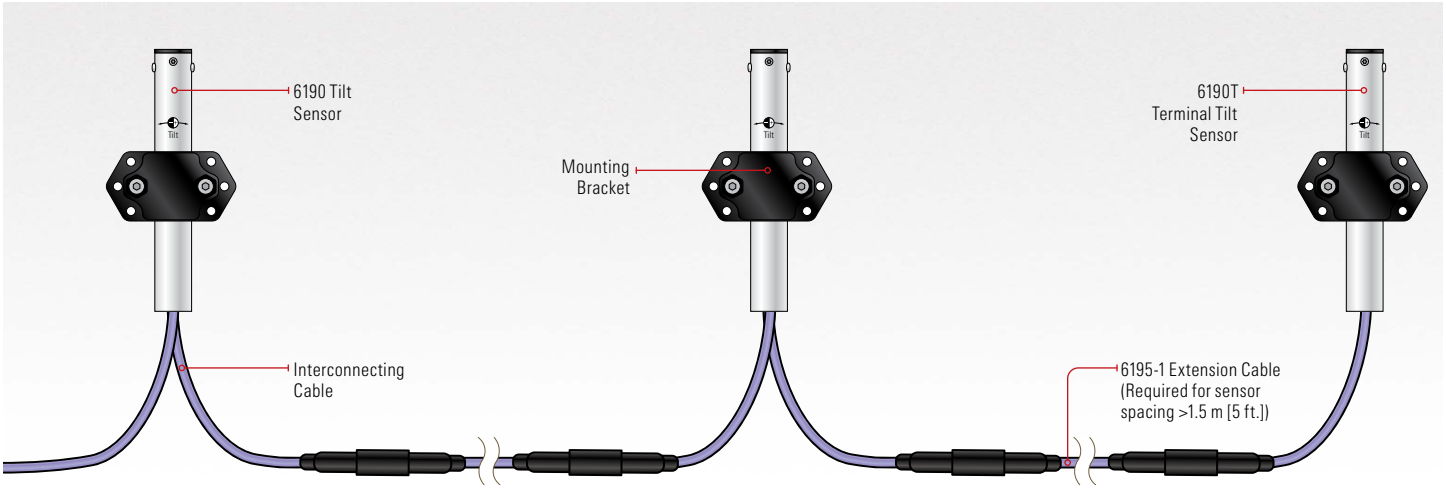
Model 6190 tilt sensors can be used with automated data acquisition systems, which allows a series of sensors to be continuously monitored for profiling purposes.

Tilt sensors can be customized to meet your needs. Our staff will work with you throughout the process. Common customizations include tilt range, temperature range, corrosion resistant housings, specialty cables, etc.

DATA ACQUISITION

The Model 6190 Tilt Sensor uses industry standard Modbus® Remote Terminal Unit (RTU) protocol to communicate. It employs an RS-485 (half duplex) electrical interface, recognized for its prevalence, simplicity, and success as a robust, industrial physical layer.

Monitoring can be accomplished using GeoNet Addressable Data Loggers, the Model 8020-38 Addressable Bus Converter, Model 8600 Series Data loggers, Campbell Scientific data loggers, or any other device capable of operating as a Modbus RTU client and having an RS-485 port.



String of interconnected Model 6190 Tilt Sensors.

TECHNICAL SPECIFICATIONS

Range[1]	±90°
Resolution[2]	0.00025° (0.004 mm/m)
Precision[3]	±0.0075° (±0.13 mm/m)
Nonlinearity	±0.005° across ±30° range (±0.09 mm/m)
Temperature Dependent Uncertainty	±0.001° across ±5° angular range (±0.016 mm/m) ±0.0016° across ±15° angular range (±0.026 mm/m) ±0.0026° across ±30° angular range (±0.042 mm/m)
Operating Temperature	–40 °C to 65 °C (–40 °F to 149 °F)
Temperature Accuracy	±0.5 °C
Power Supply Voltage	12 VDC ±20%
Operating Current [4]	12 mA ±1 mA
Standby Current [4]	2 mA ±0.1 mA
Maximum Supply Current[5]	500 mA
Sensor Diameter	25.4 mm (1")
Sensor Length	180.3 mm (7.1")
Sensor Weight	0.29 kg (0.64 lb.)
Sensor Materials	316 Stainless Steel, Engineered Polymer
Mounting Bracket Dimensions (L×WxH)	97 × 56 × 53 mm (3.8 × 2.2 × 2.1")
Mounting Bracket Weight	0.54 kg (1.18 lb.)
Mounting Bracket Materials	Black Powder Coated Aluminum
Electrical Cable	Four Conductor, Foil shield, Polyurethane jacket, nominal OD = 7.9 mm
Interface	RS-485
Protocol	MODBUS
Baud Rate	115,200 bps
Ingress Protection	IP68 to 3 MPa (300 m head water)

[1] Calibrated Range: ±30°
[2] 99% confidence interval (i.e. 99 out of 100 individual readings fall within this tolerance).
[3] Includes random walk (changes between consecutive readings that have no discernible cause) and seismic noise during testing.
[4] Operating and standby current are for each individual sensor in a string.
[5] Per entire string.

ORDERING INFORMATION

6190S: Standalone MEMS Digital Tilt Sensor, Triaxial
6190S-CR: Standalone MEMS Digital Tilt Sensor, Triaxial, Corrosion Resistant
6190: MEMS Digital Tilt Sensor, Triaxial
6190T: MEMS Digital Tilt Sensor, Triaxial Terminal sensor
6190-1: Mounting Hardware Kit
TLS-208: Rawl Setting Tool, ¼"
6180-3-1: Readout Cable, lengths <15 m (<50 ft.), bare leads
6180-3-2: as above, 16 to 30 m (50 to 100 ft.)
6180-3V: as above, lengths >30 m (>100 ft.)
6195-1-10FT: Extension Cable, 10 ft. length
6195-1-25FT: Extension Cable, 25 ft. length
6195-1-50FT: Extension Cable, 50 ft. length
6195-1-100FT: Extension Cable, 100 ft. length
6195-1-150FT: Extension Cable, 150 ft. length
6195-1-200FT: Extension Cable, 200 ft. length
02-313P9LTD: Violet Polyurethane Cable, 8 mm (0.313") Ø, twisted pairs

COMPATIBLE READOUTS AND DATA LOGGERS

8800 and 8900 Series: GeoNet Wireless Mesh Data Acquisition System
8910 Series: GeoNet Wireless LoRa® Data Acquisition System
8920 and 8921 Series: GeoNet Cellular Data Loggers
8930 Series: GeoNet Wi-Fi Data Loggers
8940 Series: GeoNet Local Data Loggers
8951 Series: GeoNet Satellite Data Loggers
8600 Series: Data Loggers

GEOKON | TRUSTED MEASUREMENTS

GEOKON
48 Spencer Street
Lebanon, NH 03766 • USA

www.geokon.com
e: teamsales@geokon.com
p: +1 · 603 · 448 · 1562

GEOKON is an **ISO 9001:2015** registered company

Not all models are CE approved. Contact GEOKON for details.

The **GEOKON**® logo and word mark are registered trademarks with the United States Patent and Trademark Office. | **GEOKON** maintains an ongoing policy of design review and reserves the right to amend products and specifications without notice. | The LoRa® Mark is a trademark of Semtech Corporation or its subsidiaries. | **LoRaWAN**® is a registered trademark of the LoRa Alliance®
Modbus is a registered trademark of SCHNEIDER ELECTRIC USA, INC. | All other trademarks are the property of their respective owners.

©**GEOKON**. All Rights Reserved. | Rev-A.6-09/10/2026