

## Description

The T230 is a Single-Mode Fiber (SM) based Fiber Bragg Grating (FBG) Long-Gauge (30 cm to 10 m) Strain Sensor for embedding into concrete and other materials.

Packaged to eliminate influences from the ambient environment. Ready for embedding into concrete or for surface mounting on structures. The long gauge length defined by the sensor's anchoring brackets yields immunity to local defects or inhomogeneities of the tested specimen. Excellent wavelength to temperature linearity. Calibration service available upon request. The accuracy and precision specifications take into account any hysteresis, non-linearities, and the repeatability of the sensor. The T230 sensor handling and installation is fast, easy and intuitive. Immune to lightning and electromagnetic interference (EMI).

T230 series Long-Gauge Strain Sensors are fabricated using licensed and proprietary state-of-the-art laser manufacturing technologies and product designs. The sensor packaging described herein represents the most popular configuration and can be customized.

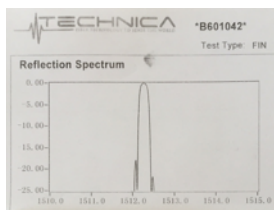


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## Key Features

### Strain and temperature linearity.

One-body T230 design for both temperature and strain measurements uses precision made FBGs written into the fibers' core for producing a transducer configuration of high linearity, resolution, accuracy, and precision. SLSR & BW options.



**Absolute temperature sensor included.** The T230 strain sensor includes a second absolute FBG temperature sensor embedded in its construction and serving as both precise temperature compensator and as independent absolute temperature sensor.

**Pre-Strain level is adjustable during installation.** Field pre-strainable to the application requirements during installation using the associated T230 Mounting Brackets and spanner keys.



**Ready to be daisy chained.** Well suited for projects that include the need to monitor strain and temperature at one or many locations. Provided as single connectorized sensors or in ready to install arrays of various lengths and flexible number of sensors.

**Multiple installation options.** The T230 can be embedded or surface mounted using welding, mounting screws, or by chemical (glue) bonding. Installation procedure provided.

**Low cost and field proven.** For demanding projects that require both low cost per sensing point and stable operation for long-term. Extensively used in field applications since 2010.

Parameter	Specifications
Wavelengths and Tolerance	1459 to 1621 nm, +/-0.5 nm; 980, 1060, 1310 nm, other
Reflection BW (FWHM)	0.6 nm; other opt.
Reflectivity % and SLSR	30%, 12 dB, other options
Strain Range	+/- 5,000 $\mu\epsilon$ , other options
Gauge Length	30 cm to 5 meters (to order)
Strain Accuracy	<0.35% FS (<0.18% FS typical)
Strain Precision	<0.15% FS (<0.10% FS typical)
Temperature Compensation	Integrated within the sensor
Temperature Accuracy	<1°C (for -20°C to +60°C range)
Ingress Protection Rating	IP67
Sensor Pigtail (Length, DIA)	1 m and 3mm, other options
Cable Bend Radius	30 mm Static, 40mm Dynamic
Optical Connector	FC/APC, or custom
Housing Material	Stainless Steel SS316L and Rugged Polyamide Tubing PA12
Dimensions, Washer	12mm DIA x L mm, 24mm
Mounting Methods	T230 Mounting Brackets welded, screwed, or glued

## Applications in Civil Engineering, Geotechnical, Energy, Industrial, and Research

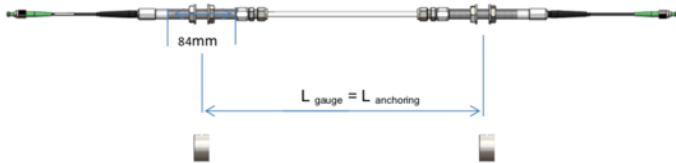
Technica undertakes a rigorous development process before products release. The company is also firmly committed to continuous improvements after release to insure performance to the highest standards, hence, specifications are subject to update without notice.

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**Welding** is the primary recommended method for achieving a long term stable bond between the monitored structure and the T230 Mounting Brackets (anchors) of the sensor. It takes 10 minutes.

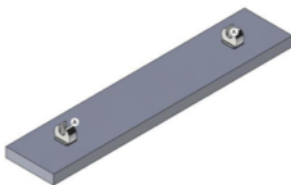
**Tools:** (1) Standard welding machine, (2) FBG interrogator, (3) Two spanner keys, size 19.

**The T230 Sensor Gauge Length** is equal to the distance between the two T230 Mounting Brackets (anchors):

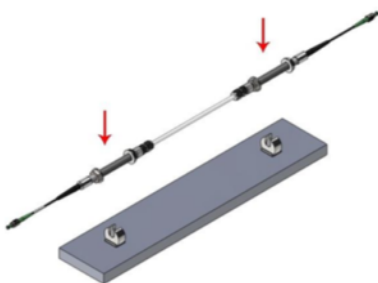


**Surface preparation for welding:** Regardless of the installation method, clean the surface to which the sensor should be applied using abrasive materials and removing any paint, rust, or debris. Chemical treatment of the surface is advised 20 minutes before the installation to avoid the creation of oxide layers on the mechanical treated surface.

**Mount the T230 SS316 Brackets to the test surface** by welding them, screwing them, or glue bonding them perpendicularly and aligned to each other on one axis:

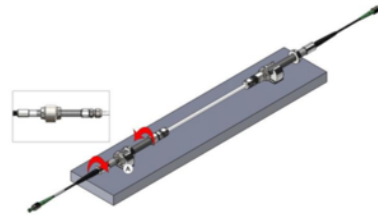


**Mount the T230 Sensor into the T230 Brackets** by moving the washers and nuts to the sides in a way that ensures there is one nut and one washer on each side of each bracket. Leave thread space for pre-straining the sensor:



### Set up the T230 Pre-Strain Level (typically to 5,000 $\mu\epsilon$ ):

The T230 does not have a built-in pre-strain. Connect the T230 sensor to an interrogation unit. Secure the sensor to the first of the two Mounting Brackets.



After securing one side of the T230 to its first Mounting Bracket, use a spanner key to rotate the inner nut at the other bracket in a clockwise direction to adjust the pre-strain to the desired level according to the current application's needs: Wavelength shift (in pm) = Pre-strain ( $\mu\epsilon$ ) \* 1.2. The sensor will elongate according to its gauge length "L" as follows (approximations for 5000 $\mu\epsilon$ ):

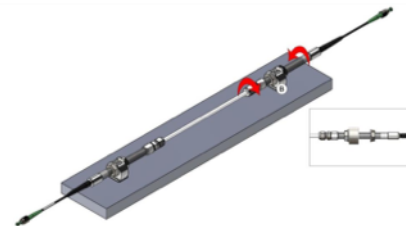
L = 0.35m, Wave shift = 6000pm and Elongation = 1.75mm

L = 0.5m, Wave shift = 6000pm and Elongation = 2.5mm

L = 1m, Wave shift = 6000pm and Elongation = 5mm

L = 2m, Wave shift = 6000pm and Elongation = 10mm

L = 5m, Wave shift = 6000pm and Elongation = 25mm



Use a thread securing adhesive (such as Loctite 2701) after sensor is fixed and pre-strained in the Mounting Brackets.

### Alternative mechanical installation (screwing):

Use two standard M8 metric screws (one at each side). These screws are supplied with the Mounting Brackets. This method could be applicable to concrete walls, to other materials, and to metal structures (if spot welding is not allowed). Drill the holes at the proper anchoring distance.

### Alternative chemical installation (glue bonding):

Use an adhesive that bonds the sensor with the measured surface. The glue is not supplied with the sensor. The selection of the right glue highly depends on the material of the surface and environmental conditions (examples are Loctite 3450 for steel, and EPO-TEK 730 for concrete).