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What is Strain?

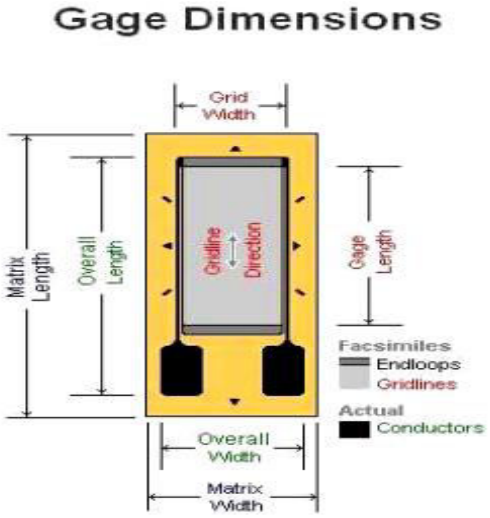
- Strain is the amount of deformation of a body due to an applied force. More specifically, strain is defined as the fractional change in length.
- When a force is applied to a structure, the components of the structure change slightly in their dimensions and are said to be strained.
- Devices to measure these small changes in dimensions are called strain gages.

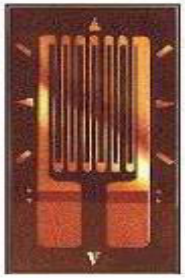
Characteristics of Strain

- The ideal sensor for the measurement of strain would - Have good spatial resolution, implying that the sensor would measure strain at a point - Be unaffected by changes in ambient conditions - Have a high-frequency response for dynamic strain measurements.
- A device that closely meets these characteristics is the resistance strain gage.

Strain Gage

A strain gauge, a device whose electrical resistance varies in proportion to the amount of strain in the device. The most widely used gage is the bonded metallic strain gage.

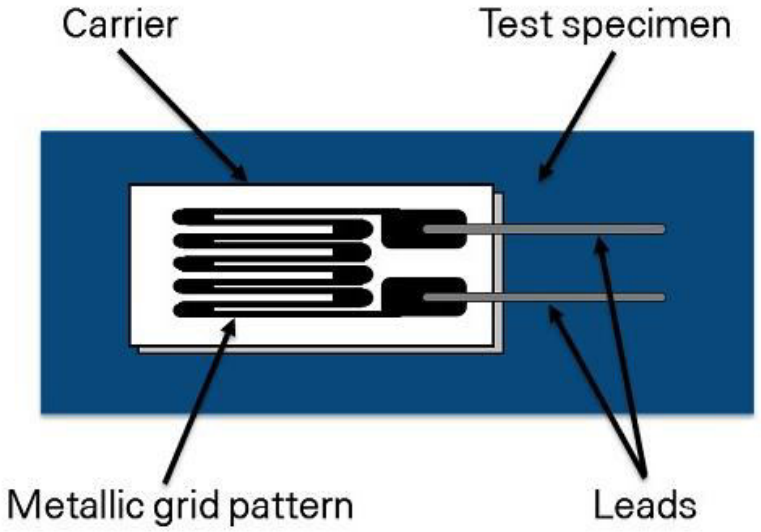




How do you measure strain?

A strain gage's electrical resistance varies in proportion to the amount of strain in the device. The most widely used strain gage is the bonded metallic strain gage. The metallic strain gage consists of a very fine wire or, more commonly, metallic foil arranged in a grid pattern. The grid pattern maximizes the amount of metallic wire or foil subject to strain in the parallel direction. The grid is bonded to a thin backing called the carrier, which is attached directly to the test specimen. Therefore, the strain experienced by the test specimen is transferred directly to the strain gage, which responds with a linear change in electrical resistance.

A fundamental parameter of the strain gage is its sensitivity to strain, expressed quantitatively as the gage factor (GF). GF is the ratio of the fractional change in electrical resistance to the fractional change in length, or strain:



$$GF = \frac{\Delta R/R}{\Delta L/L} = \frac{\Delta R/R}{\varepsilon}$$

The electrical resistance of metallic grid changes in proportion to the amount of strain experienced by the test specimen.