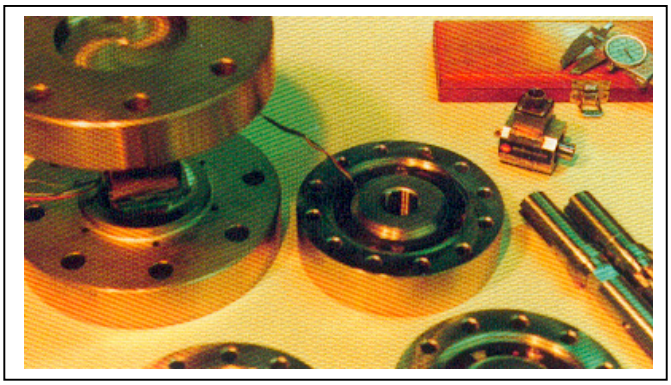
STRAIN GAGE SENSORS & TRANSDUCERS



Definitions

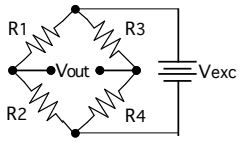
Strain Gage: Resistance measuring element for transducing force, pressure, or tension induced strain into an electrical signal.

Wheatstone Bridge: Combination of four (4) resistance measuring elements, such as strain gages, configured as shown below.

R_1, R_2, R_3, R_4 = Strain Gage Resistors

V_{out} = Output voltage

V_{exc} = Excitation volta



Transducer: Device for converting energy from one form to another for the purpose of measurement of a physical quantity.

Sensor: Device that responds to a physical stimulus and transmits a signal or changes an electrical property such as resistance.

Note: Transducer and Sensor are often used interchangeably.

Transduction: Process by which a transducer or sensor accepts energy in one form and gives back related energy in a different form; e.g., "the transduction of force into voltage by a strain gage bridge."

Transduction Method Using Strain Gages

Four (4) strain gages configured as a Wheatstone bridge are bonded to the interior-sensing element of the transducer or sensor. When a fixed voltage, referred to as excitation voltage, is applied across the excitation arms of the bridge, the unloaded condition of the transducer has a signal output of zero volts. When a force is applied to the transducer the length of the strain gages and therefore the resistance of the strain gages changes minutely causing the strain gage bridge to become electrically unbalanced. This unbalanced condition results in a voltage output that is proportional to the physical load applied to the transducer, and transduction of a force into a voltage is the result. A strain gage transducer can be calibrated in the field by using the shunt calibration transfer method. An electrical signal equivalent to that produced by a known load can be obtained by shunting one arm of the Wheatstone bridge with a precision wire wound resistor. SensorData provides the precision wire wound resistor, the value of the electrical signal produced by the precision resistor, and the value of the equivalent load with the calibration documents.

Load Cells, Torque Sensors and Multi Component Sensors

A structure is said to be a load cell or "force" sensor when the measurand is a single component vector applied to the structure. Although the term "mass" and "force" are used interchangeably, the term "force" most accurately describes the loading condition. A torque sensor measurand is the combination or "couple" of force and distance vectors. Multi component sensors are designed to accommodate and simultaneously measure two or more axes of interest. SensorData's multi component transducer structures are constructed to minimize the effects of extraneous loading. However, caution should be exercised in situations of multiple axes loading. Extraneous forces can also be present in single component load cells and torque sensors under conditions of misalignment. Extraneous forces can create an error condition and also decrease the working life of the sensor when the combined stress exceeds the safe working capacity of the sensor.