

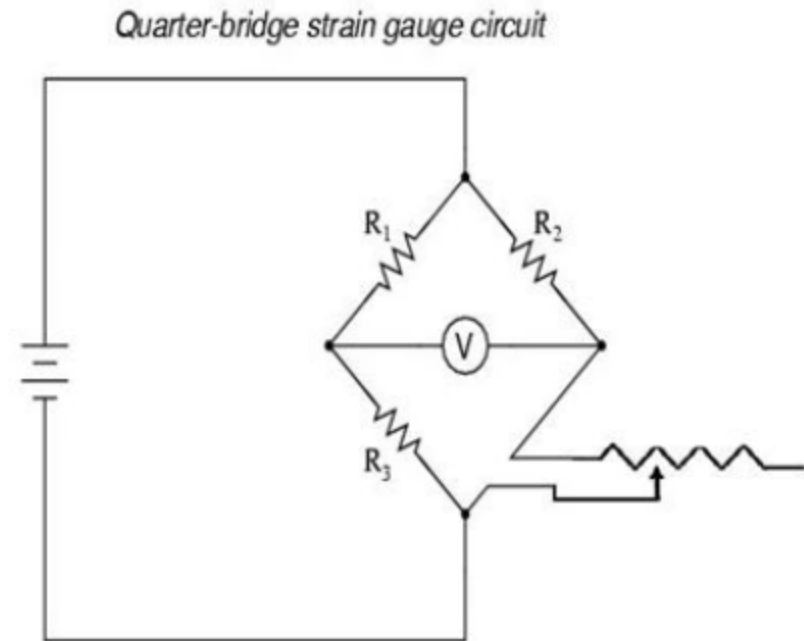
18ECO134T – Sensors and Transducers

Unit IV : Session 8 : SLO 2

Wheatstone Bridge

What is it?

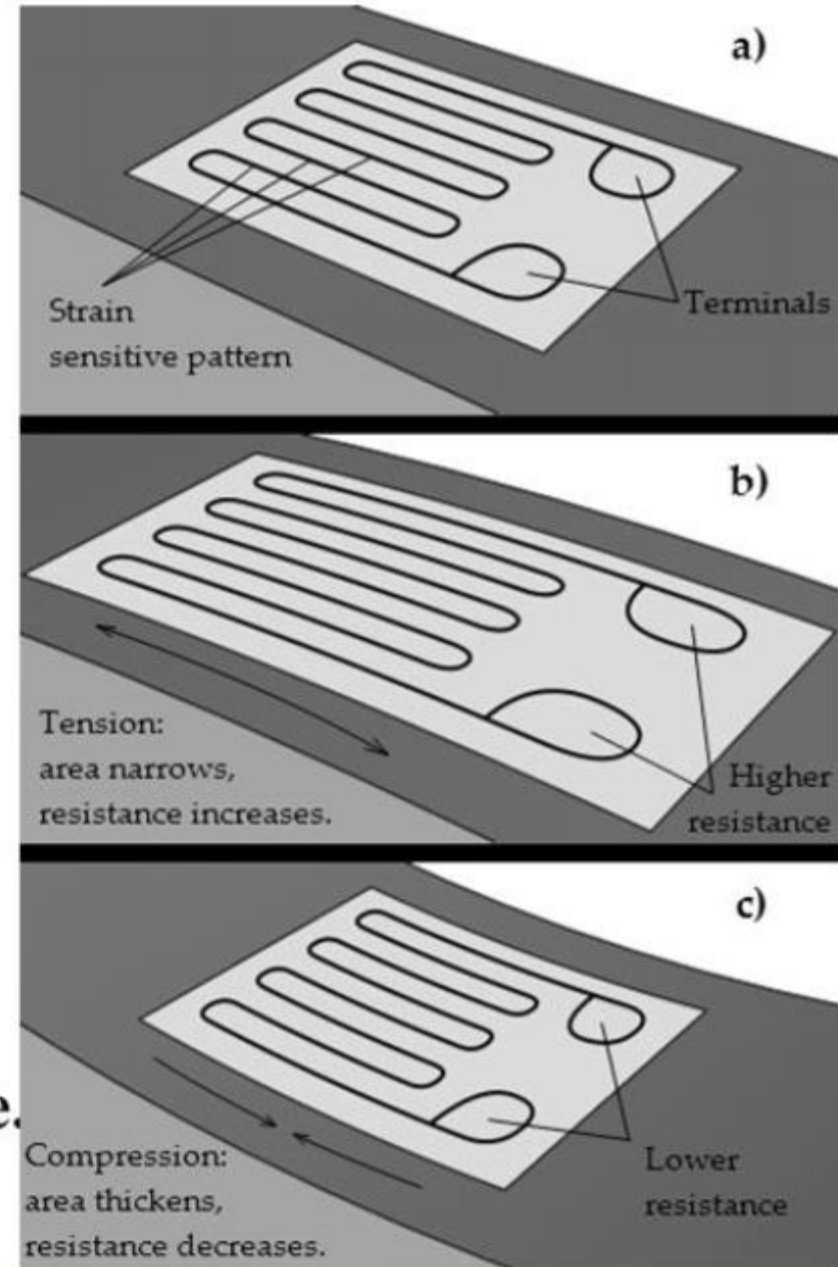
- ❑ A Wheatstone bridge is an electrical circuit.
- used in a load cell to measure an overall change in resistance.
- increases sensitivity and reduces the affects of temperature.



Strain gauge

How does it work ?

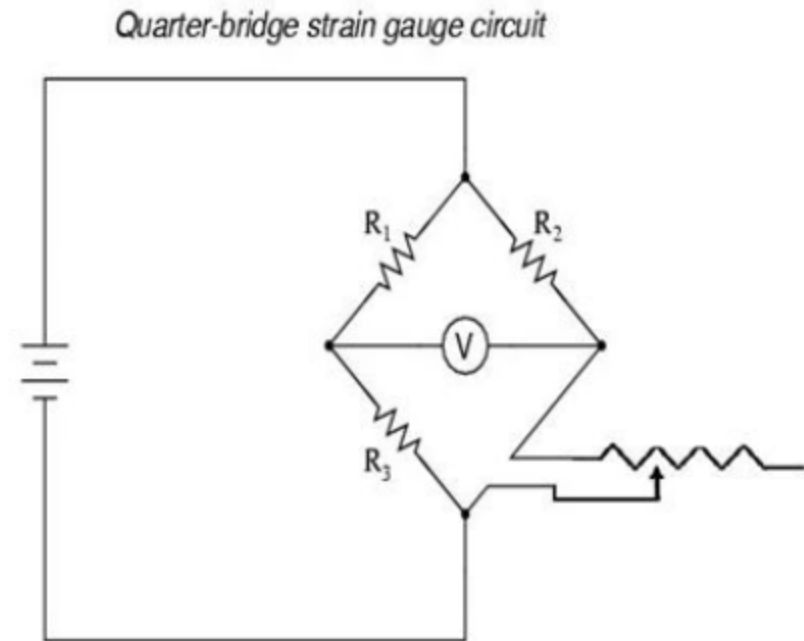
- ❑ Foils/filaments inside the strain gauge are about 1/1000 inch diameter and made up of basic metal conductors.
- ❑ The gauge is attached to the object by a suitable adhesive.
- ❑ As the object is deformed, the foil is deformed causing its electrical resistance to change.
- ❑ The resistance change is commonly measured using a **Wheatstone Bridge**.



Wheatstone Bridge

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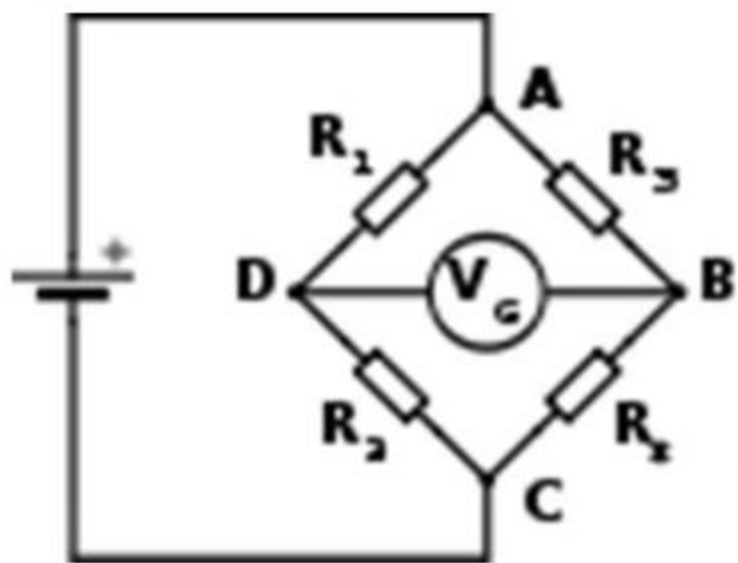
Wheatstone Bridge

How does it work?

If $\frac{R_2}{R_1} = \frac{R_x}{R_3}$ then circuit is said to be balanced.

Very small change in R_x disrupt the balance and can be measured precisely.

$$V_G = V \left(\frac{R_x}{R_x + R_3} - \frac{R_2}{R_2 + R_1} \right)$$



Continued.....

Mechanical and other load cell

Load Cell Type	Weight Range	Accuracy	Apps	Strength	Weakness
Hydraulic	Up to 10,000,000 lbs	0.25%	Tanks, bins, & hoppers	Takes high impacts, insensitive to temp	Expensive complex
Pneumatic	Wide	High	food industry, hazardous areas	Intrinsically safe	Slow response. Require clean, dry air
Helical	0-40k lbs	0.2%	Platform, forklift, wheel load	Handles off-axis loads, overloads	
Fiber Optic		0.1%	Electrical transmission cables	Immune to RFI/EMI	
Piezo-resistive		0.03%		Extremely sensitive, high signal output level	High cost, nonlinear output

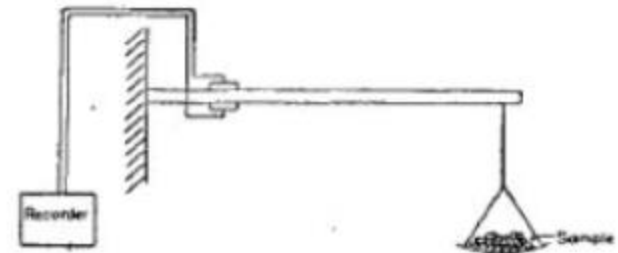
Instron Tensile Tester

- ❑ Used to measure the tensile strength, load-elongation curve for the fabrics as well as yarns.
- ❑ Efficiently detect the strain. strain gauges are bounded to the position on the spring material where strain is largest.



Measurement of weight (Moisture regain tester)

- ❑ A sample of loose fibre or any textile material which has been subjected to a drying treatment is hung from a cantilever of proper dimensions, to which has been bonded a set of strain gauge.
- ❑ As the sample changes in weight because of moisture regain, the stress in the beam increases and following through the changes take place in the gage and with the help of this it is possible to record continuously the rate of moisture regain of the material.



Cost of load cell

SERIESE OF LOAD CELL	SPECIFICATION OF LOAD CELL	CAPACITY	PRICE (in Dollars)
LCFD	Miniature low profile tension/compression	1 kg	750
LCGD	Miniature low profile compression	1000 lb.	460
LC400	Low profile tension/compression	5000 lb.	730
LC100	S-Beam tension/compression	100 lb.	305
LC500	Cantilever beam tension/compression	5000lb.	350
TWA5, TWA6	Self adjusting weight module with LC501 load beam included	10000 lb.	615