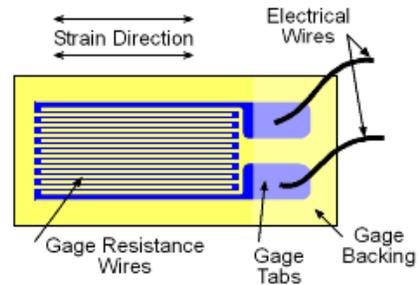


Quick Intro to Strain Gages & Load Cells

Strain gages and load cells serve to measure forces from pulling, pushing, twisting, and weights of all sizes.

They work by stretching thin foil designed in a zig-zag pattern. The gage must be bonded (glued) to the part you wish to measure. When the foil is elongated, electrons move less freely, increasing the electrical resistance. Since there is a change in resistance (R), there is also a change in the voltage (V) across the gage.



Historic Dudes

1827

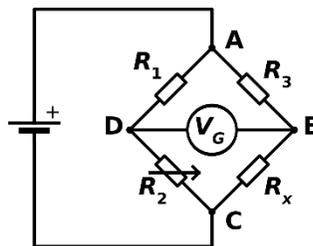


Georg Ohm discovered the relationship between voltage, current and resistance using the equation $V = IR$. Units of electrical resistance are named after him.

1868



Charles Wheatstone put (4) individual resistors in a cool diamond shape to make the Wheatstone Bridge configuration.



Wheatstone Bridge

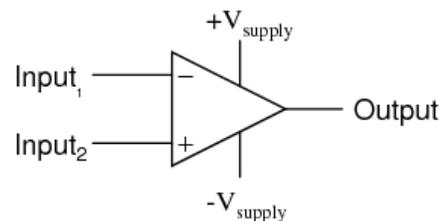
As voltage is sent through the bridge, small changes in voltage from stretching can be measured with reduced interference from other variables such as temperature.

For example, the change in voltage between diagonal points D and B can be measured as one goes up and the other goes down. The voltage between two points is known as a differential measurement. These outputs are tiny voltages in the millivolt range (1/1000 V).

Turn It Up

Since they are so small, the tiny voltages can be amplified in order to make them easier to measure. Common amplifications, called gains, range between 100x and 1200x.

Differential amplifier



Ship It Off

Next, this amplified signal can be read as an analog voltage or fed to an analog-to-digital converter (ADC). Once in a digital format, it can go to a meter display, out on a CAN (Controller Area Network) Bus, or sent as a wireless radio signal.



Example of a rugged strain gage amplifier/conditioner module with CAN Bus Output. (Techmor Inc)

Quick Tips

- Select the best gage/load cell for the material and stress level to get the biggest response
 - Contact the gage manufacturer for help with your application

- Keep the gage connection wires short to reduce noise
 - Electrical fields are all around us and low-voltage wires can act like antennae to pick up noise.

- Set your gain value so the maximum strain will give the maximum readable output
 - This will use the full range of your instrumentation, and give the best resolution.

- Shielding
 - If you use a shielded wire from the strain-gage to your amplifier, only ground the wire at the amplifier end. Do not tie it to ground at the strain-gage end.

Conclusion

Strain gages and load cells can accurately measure loads, strain/stress, and torque with some knowledge and proper selection.

See techmor.com for strain gage amplifiers, CAN bus tools, and wireless solutions.

