

What's a load cell and how does it work?

A load cell is a device that is used to convert a force into electrical signal. Strain gauge load cells are the most common types of load cells. There are other types of load cells such as hydraulic (or hydrostatic), Pneumatic Load Cells, Piezoelectric load cells, Capacitive load cells, Piezo resistive load cells..etc.

Load cells are used for quick and precise measurements. Compared with other sensors, load cells are relatively more affordable and have a longer life span.

How Strain Gauge load cell works

The principle of operation of the Strain Gauge load cell is based on the fact that the resistance of the electrical conductor changes when its length changes due to stress. Cu Ni alloy is commonly used in strain gauge construction as the resistance change of the foil is virtually proportional to the applied strain. The change in resistance of the strain gauge can be utilized to measure strain accurately when connected to an appropriate measuring circuit. A load cell usually consists of four strain gauges in a Wheatstone bridge configuration. The electrical signal output is typically very small in the order of a few millivolts. It is amplified by an instrumentation amplifier before sending it to the measurement system. The output can be Digital or Analog (0-5V) depending on the application.

How Capacitive Load Cell Works

Capacitive load cells is based on the principle where the capacitance of a capacitor changes as the load presses the two plates of a capacitor closer together. The construction of a capacitive sensor is simpler than a resistive load cell.

Capacitive techniques can be used to measure proximity, humidity, tilt, force, torque, fluid quality, acceleration and many other physical parameters. It is a very versatile parameter that offers tremendous sensitivities in a small package. The capacitive technology is more rugged than strain gauge designs and can therefore be used in a wider variety of engineering applications.

How Hydraulic Load Cell works

Hydraulic load cells are force-balance devices, measuring weight as a change in pressure of the internal filling fluid. In hydraulic load cell, a load or force acting on a loading head is transferred to a piston that in turn compresses a filling fluid confined within an elastomeric diaphragm chamber. As the force increases, the pressure of the hydraulic fluid increases. This pressure can be locally indicated or transmitted for remote indication or control. This sensor has no electric components and immune to transient voltages so it is ideal for use in hazardous areas. The advantages of Hydraulic load cells are it is expensive and very complex.

How Pneumatic load cell works

Pneumatic load cells operate on the force-balance principle. These devices use multiple dampener chambers to provide higher accuracy than can a hydraulic device. Pneumatic load cells are often used to measure relatively small weights in industries where cleanliness and safety are of prime concern.