

The Cost of Reliability

Why Choosing the Right Differential Pressure Transducer May Be the Most Important Decision You Make on the Next Job



TEESING

WWW.TEESING.COM

Selecting a low-differential pressure transducer for a critical environment is one of the most important decisions mechanical designers, engineers and architects can make when designing a building ventilation system. With the number of inherent safety risks which exist in critical environments, selecting a reliable differential pressure transducer can alleviate unnecessary future headaches. Low-differential pressure transducers accurately measure the very low differential pressure of a critical room space pressure relative to the adjacent space pressure; usually an adjacent corridor or anteroom. The differential pressure gradient is used to prevent airborne infections or contaminants from moving from a protected space to contaminated space, or vice versa. Pressures can be either positive for protective isolation (operating rooms, clean rooms, etc.), or negative for airborne infectious isolation control.

Over the years many different sensing technologies have been used to monitor the differential pressure in critical environments, however with focused improvements in safety and efficiency many sensing technologies have been found less reliable in these applications. One such example is the flow through sensor (i.e. hot wire anemometer); while less expensive it is far more susceptible to long-term stability issues at low ranges and have issues with contamination. Most critical environments have migrated over to the use of dead-ended sensors; the most common of which are piezoresistive strain gauge and capacitive sensors.

The piezoresistive strain gauge is typically made from silicon and joined to a steel substrate through metal-to-metal bonding. The piezoresistive strain gauge offers good resolution and bandwidth and is often chosen for cost-sensitive applications; however, there are limitations to this sensor. Their high sensitivity to temperature changes and tendency to drift are disadvantages. The primary problem, however, is that this type of sensor cannot be made large enough for sensed pressures to deform the diaphragm effectively. Although the diaphragm could be made thinner, it would compromise its strength and integrity. Making the silicon diaphragm larger would make it cost prohibitive. When used in low-pressure ranges, the result is noise and compromised long-term stability. Consequently, they are much better suited for high-pressure ranges.

Capacitive transducers have become a mainstay in critical applications. The principal advantages of capacitive pressure sensors over piezoresistive pressure sensors are increased pressure sensitivity and decreased temperature sensitivity. A capacitive transducer configuration consists of a compact housing that contains two closely spaced, parallel, electrically isolated metallic plates. These firmly secured plates are mounted so that a slight mechanical flexing of the assembly, caused by a minute change in applied pressure, alters the gap between them, thereby creating a variable capacitor. The resulting change in capacitance is detected by a sensitive linear comparator circuit, which amplifies and outputs a proportional, high-level voltage signal. The extremely small deflection of the diaphragm helps minimize hysteresis and repeatability errors while providing fast response times. This rugged design provides greater measurement accuracy, long-term stability and higher output level than competitive technologies which is why it is the preferred solution for critical environments.

The integrity of the ventilation control system is essential in maintaining a contaminant free environment. Whether a room is to be maintained at a negative pressure to prevent contaminants from escaping into adjacent areas or a positive pressure to protect patients from outside non-sterile air, the proper pressurization of a room is essential. Critical environments require the highest accuracy at the lowest of pressure ranges, which is why it is essential to use a capacitive based transducer in these stringent applications. When it comes to accuracy and long-term stability at the lowest pressure ranges, building owners and designers are rewarded when they rely on capacitive sensors.



Setra Systems is a leading global designer and manufacturer of pressure sensors and transducers, humidity transmitters, current switches, current transducers, and calibration equipment for the HVAC and Industrial markets