



Ensuring the Most Accurate Air Quality Readings

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Importance of Accurate Air Quality Measurements

Air quality is a serious topic these days. From airborne viruses to pollution, allergens and gas leaks, accurately ensuring the safety of the air we breathe is paramount. To do so, organizations use air quality measurement devices to measure particles and other contaminants in the air, like the one shown in Figure 1.



Figure 1 – Air Quality Measuring Device from Particles Plus

Air quality embodies a host of applications including:

- 1) Air filtration systems that monitor not just the flow rate of air, but the quality as well
- 2) Carbon monoxide detectors to ensure carbon monoxide levels do not exceed safety levels
- 3) Fume hood monitors to limit exposure to hazardous or toxic fumes, vapors or dust
- 4) Clean room environments to ensure dust or other particles do not contaminate the laboratory or manufacturing facility
- 5) Radon detectors to determine levels of radon in the environment
- 6) Air purifiers to ensure the air flow meets the air quality requirements
- 7) Smoke detectors to help provide early detection of a potential fire
- 8) Carbon dioxide detectors to indicate levels of carbon dioxide in the air
- 9) Smog detectors to measure pollution coming from an automobile exhaust
- 10) Outdoor air monitoring to measure levels of pollutants in the air (see Figure 2) – to see real-time air quality scores throughout the world, [click here](#)

This is a partial list as there are many use cases to accurately measure air quality.



Figure 2 – Air Pollution and [Impact on Health](#)

The Role of Differential Pressure Sensors in Measuring Air Quality

Differential pressure sensors measure the difference in air flow and play a critical role in measuring air quality where determining exposure to potential contaminants is important. There are many airborne particles that if they exceed a certain amount can be hazardous: airborne viruses, carbon monoxide, radiation, toxic fumes, etc. – the number of potential contaminants is endless.

The system works as follows: through a flow element, such as a Venturi, the differential pressure sensor measures air flow between its two ports. This enables the air monitoring system to calculate the particle density in the air for which it is measuring. Based on the result, the system may generate an alarm or other warning if the density exceeds a predetermined value.

However, as with most electromechanical devices differential pressure sensors are sensitive to many external factors including noise, humidity, temperature and physical positioning. Differential pressure sensors that reduce the impact of external factors will provide the most accurate differential readings for computed airflows and thus air quality measurements.

Superior's System-in-a-Sensor: Better Performance & Lower System Cost

Superior Sensors' proprietary [NimbleSense™](#) architecture is the industry's first System-in-a-Sensor integrated platform. Incorporating a highly differentiated advanced pressure sensing system with the ability to integrate optional building blocks, enables us to combine the highest accuracy and reliability with lower overall system cost. For air quality applications, we have developed our HV Series of differential pressure sensors.

Highest Levels of Accuracy

The HV Series was designed to provide the highest levels of accuracy and greatest reliability for air quality and other HVAC applications. The HV Series provides accuracy within 0.10% of the selected pressure range with long-term stability as low as 0.10% and Total Error Band (TEB) within 0.15% FSS. These market leading figures ensure the highest accuracy when monitoring air quality levels.

Lowest Noise Floor

The HV Series offers our integrated [advanced digital filtering](#) technology – a multi-order filter that utilizes advanced filtering capabilities on the front-end of the sub-system to eliminate critical noise created by fans, blowers or other dry air/gas sources prior to reaching the pressure sensor. This reduces system noise levels by 10x or more, and allows the sensor to make extremely accurate readings.

Integrated Closed Loop Control

The NimbleSense architecture's integrated [closed loop control](#) can be applied to improve the reliability and speed/responsiveness of the air quality monitoring device. This capability can significantly reduce loop delays and ensures accurate readings by directly controlling motors,

valves and actuators. This integrated capability also simplifies product design, reduces system power/heat and provides an improvement in accuracy.

Multi-Range™ Technology

One of the most innovative NimbleSense architecture features found in all of our differential pressure sensors is our unique [Multi-Range](#) technology that allows one sensor to replace several different sensors. On the HV Series, Multi-Range can support up to 8 different pressure ranges with each pressure range factory calibrated and optimized to ensure no degradation in total error band, accuracy or stability regardless of the range selected. Figure 3 shows the difference between a typical differential pressure sensor and the Superior Sensor’s HV Series.

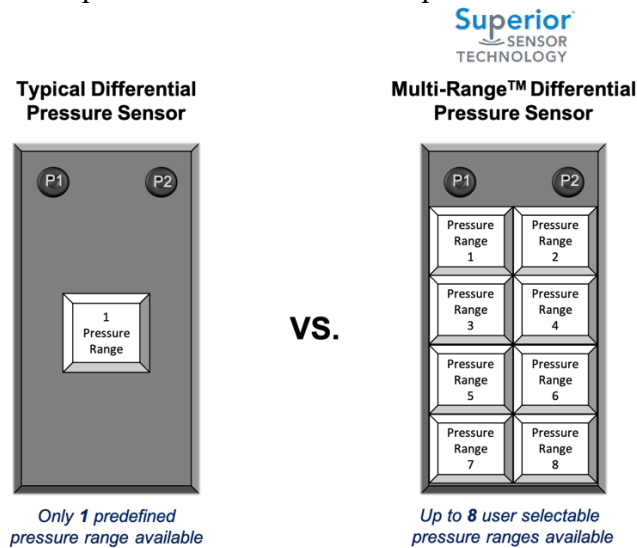


Figure 3 – HV Series Multi-Range Technology Comparison

With Multi-Range, pressure ranges can be changed ‘on the fly’ so that one device in the field can be used to serve multiple purposes. Multi-Range also enables manufacturers to bring product variants to market quickly and reduces inventory costs and product obsolescence since only one SKU needs to be stocked.

Position Insensitivity

Extremely beneficial for eliminating concerns with sensor orientation and ideal for handheld or portable air quality measuring devices, Superior’s unique dual-die implementation with the HV210 maintains consistent and highly accurate readings regardless of physical orientation or movement of the air quality measuring device. Rated with a positional sensitivity to within 0.25 Pa, the HV210 is an industry leaders with respect to position insensitivity.

Reduction in System Costs

By utilizing a System-in-a-Sensor approach where the sensor module integrates many advanced functions and multiple pressures in one device, Superior Sensors is simplifying product design and helping bring down system costs. In addition to the Multi-Range cost savings mentioned above, the integrated closed loop control and advanced digital filtering provide further system

cost savings. With these capabilities directly in the sensor module, there is no longer a need to externally design these functions with discrete components. This reduces BOM cost and PCB footprint, increases reliability and speeds time to market.

Conclusion

There is no question behind the importance of air quality measurement devices. Whether tracking internal or external air quality, the need to accurately detect dust particles, chemicals, viruses and other pollutants will continue to grow. With more air quality devices being deployed, ensuring their reliability is just as important. Removing unnecessary components reduces the number of field failures. Further, allowing the air quality devices to be configured ‘on the fly’ maximizes flexibility and expands the potential uses of the system.

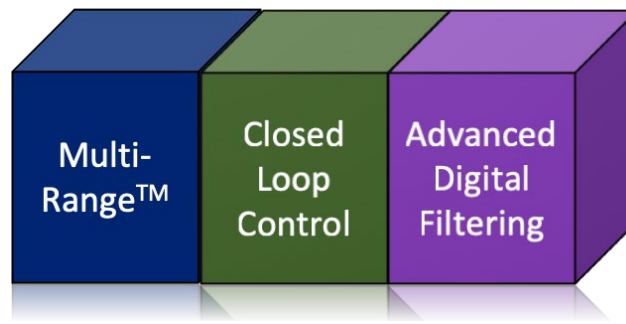


Figure 4 – NimbleSense Building Blocks for Air Quality Applications

The NimbleSense architecture has several building blocks (see Figure 4) that are customized specifically for air quality applications:

- Multi-Range
- Closed Loop Control
- Advanced Digital Filtering

Major worldwide manufacturers such as [Johnson Controls](#) and [Dwyer Instruments](#) have entrusted Superior Sensor Technology for their differential pressure sensors needs. Our unique differential pressure sensor technology, based on our proprietary NimbleSense architecture, provides many differentiating features resulting in the most accurate air quality monitoring devices. For more detailed information about our solutions, please visit our [HV Series product page](#) or [contact us](#).

SuperiorTM

SENSOR
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