

# How Pressure Sensors Overcome Today's Challenges in Healthcare

Alfredo Arteta, Americas Product Manager, Healthcare Vertical, Honeywell

Martin Murray, Global Application Engineer, Honeywell

## KEY TAKEAWAYS

- The pandemic has changed the healthcare industry and medical device requirements forever.
- Modern pressure sensors allow manufacturers to create better healthcare products.
- Current trends in design, supported by Honeywell, are impacting the types of innovative healthcare products being developed.
- Honeywell's sensors are used in a broad range of medical applications.
- Honeywell's proprietary micropressure platform is being used in unique and demanding applications.

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## OVERVIEW

Changes to the healthcare industry driven by Covid-19 require faster innovation, more connectivity of devices and use of data, and a greater focus on patient-centric care. In addition to these industry trends are trends in design resulting in sensors that are smaller, weigh less, have longer battery life, and are highly reliable.

Honeywell's broad portfolio of pressure sensors are used by healthcare device manufacturers in a wide variety of applications and devices. Honeywell's sensors and the products in which they are used are reliable and high performing, and improve patient health and well-being. Looking to the future, Honeywell is continuing to invest in technologies that further the development of new healthcare products and that increase productivity and efficiency for healthcare organizations.

## CONTEXT

Alfredo Arteta and Martin Murray of Honeywell discussed how the healthcare industry has changed since the pandemic began, described current trends in design, and explained how today's sensor technologies, particularly those from Honeywell, are helping design engineers develop new high-performing products.

## KEY TAKEAWAYS

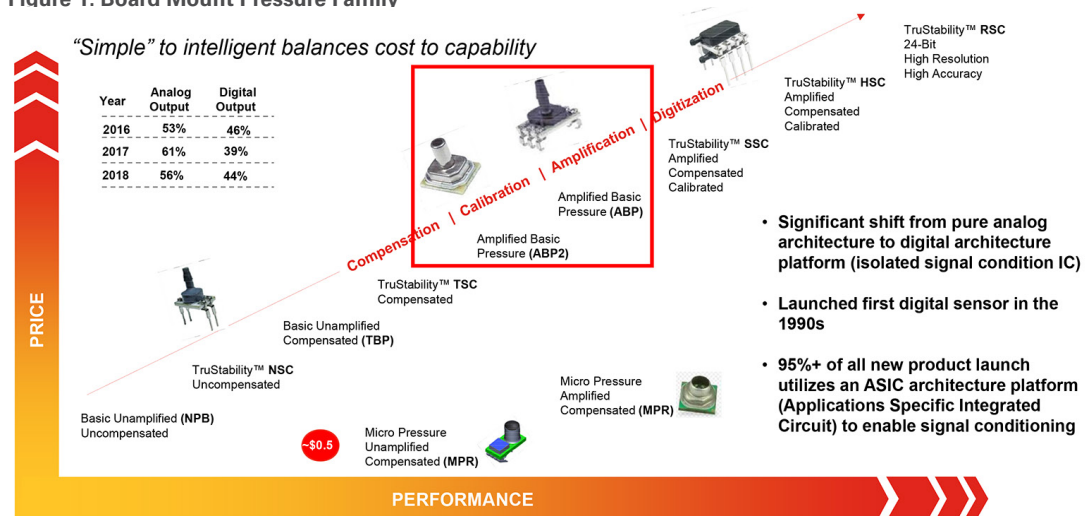
### The pandemic has changed the healthcare industry and medical device requirements forever.

Modern medicine is affording people longer and healthier lives, but the coronavirus pandemic has forced the healthcare industry to rethink everything. Changes permeating the healthcare industry include the need for much faster innovation (the Covid-19 effect); connected devices that share data, which is aggregated and analyzed; getting closer to patients through digital platforms; and emphasizing patient-centric care.

### Modern pressure sensors allow manufacturers to create better healthcare products.

Honeywell's board mount pressure family (Figure 1), which provides a broad portfolio of options at different prices with different levels of performance, allows designers to create products to address needs throughout the healthcare space.

Figure 1: Board Mount Pressure Family



Among the key design considerations for medical devices in various applications are weight, size, portability, and performance. Modern pressure sensors allow manufacturers to create smaller, lighter, more portable devices. These new pressure sensors are largely digital. The move from pure analog architecture to digital architecture has been embraced by designers and engineers in the healthcare industry.

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**95% of all new product launches utilize an ASIC (Application-specific integrated circuit) architecture platform to enable signal conditioning.**

*Alfredo Arteta, Honeywell*

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Modern pressure sensors have significant improvements as compared to older pressure sensors, including:

- **Greatly reduced size**, in some cases 70% reduction in area.
- **Decreased weight**, in some cases 15-20 times lighter.
- **Increased accuracy and reliability**. New models have error bands of less than 1%, compared to older models with error bands of 5%.
- **Increased sensitivity**. Older models sensed 1 PSI, while newer models can sense 1/30th of a PSI.
- **Better power efficiency**.

These design improvements allow engineers and designers to develop innovative new products and devices. Honeywell's team has even been surprised at the creativity displayed by the applications designed utilizing pressure sensors.

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**I'm amazed; basically every day I come in there's somebody using a pressure sensor in a way that I hadn't really envisioned or the team had envisioned. There's a lot of creativity out there.**

*Martin Murray, Honeywell*

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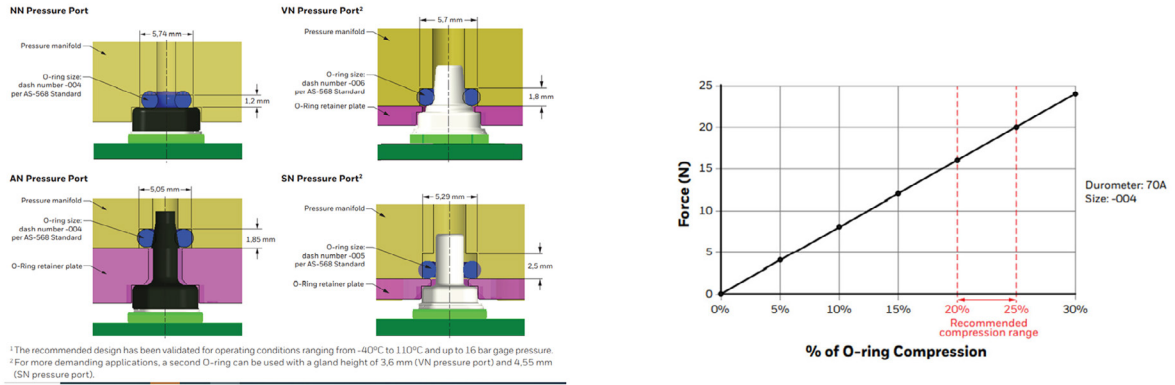
**Current trends in design, supported by Honeywell, are impacting the types of innovative healthcare products being developed.**

Smaller size and weight of sensors along with longer power, longer battery life, and increased reliability are driving the following trends.

- **Move towards manifold mount design**. Manufacturers are moving to smaller assemblies and lean manufacturing techniques. This has pushed manufacturers to change the way end users connect to the ports of pressure sensors. There are several methods to connect to the ports of a sensor depending on the application and system design. The overall trend is manifold mount design to connect to the ports.

In the past, tubing was used to connect to the port. Now, plastic or metal manifolds can be used in place of tubing. The lack of tubing eases assembly and shrinks the pneumatic footprint. This allows designers to create smaller, more mobile devices. Additionally, tubing can potentially leak or crack; manifold design eliminates this issue. There is also less chance for error, as there is less chance of attaching a tube to the incorrect sensor.

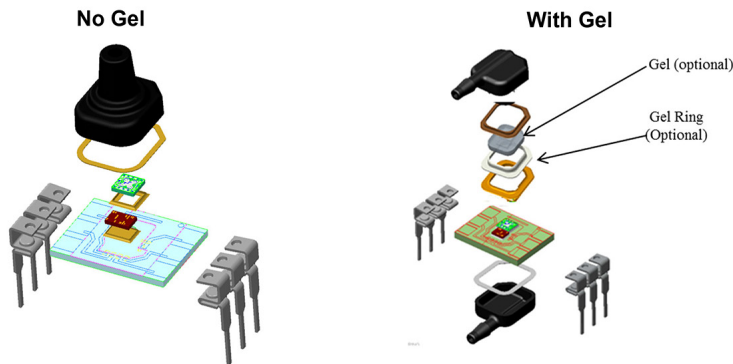
Figure 2: Manifold Mount Designs for Assembly Pressure – ABP2 Series Examples



- Moving devices closer to the patient.** Medical professionals are looking to get closer to patients when taking various measurements. The closer a device is to a patient, the faster and more accurate a measurement will be. However, moving closer to a patient can increase humidity from condensation or from a patient’s breath, which can compromise the pressure sensor.

Wet/wet capable sensors eliminate the moisture problem. This capability ensures that a sensor can be exposed to moisture on both sides. The Honeywell ABP2 series has wet/wet capability, where a gel ring protects the integrity of the sensor.

Figure 3: How ABP2 Series Wet/Wet Capable Protects Sensors







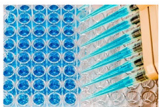





- More portable devices.** As patients receive more care at home and want to take their devices wherever they go, portability has become an important design trend. To enable portability, devices need sensors with low power draw for longer battery life. To save battery life, Honeywell makes pressure sensors that only need to be awake for milliseconds, before automatically going back to sleep.
- More reliable pressure sensors.** Medical devices require highly reliable pressure sensors. Proving reliability to the Food and Drug Administration (FDA) can be a cumbersome task, as the FDA asks for detailed information about the reliability of every component of a device, including the pressure sensor. Honeywell provides customers documentation to prove reliability to the FDA.

**Honeywell’s sensors are used in a broad range of medical applications.**

Just as the world and the healthcare industry have changed, so too has Honeywell. Honeywell continues to invest in technologies that will further the development of new products in healthcare.

Honeywell’s pressure sensor portfolio ensures that any device manufacturer will have the right pressure sensor for their application. Among the demanding applications where Honeywell pressures sensors are used are ventilators and anesthesia, dialysis, infusion pumps, and wearables and disposables.

**Figure 4: Medical Applications Using Honeywell Pressure Sensors**

<b>Ventilators &amp; Anesthesia</b>	<b>Dialysis</b>	<b>Infusion Pumps</b>	<b>Patient Monitoring</b>	<b>Laboratory Equipment</b>
				
<b>Blood Pressure</b>	<b>Hospital Equipment</b>	<b>Consumer</b>	<b>Wearables &amp; Disposables</b>	<b>New Innovation</b>
				
<b>ENHANCED ACCURACY, PERFORMANCE AND RELIABILITY – IMPROVING PATIENT HEALTH &amp; WELL-BEING</b>				

Manufacturers choose Honeywell’s sensors because Honeywell is a reliable vendor that has been around for decades, has a broad, stable product portfolio, and provides numerous options. This includes housing options, porting options, and diagnostic options.

**You want a vendor that doesn’t have a lot of churn in their product portfolio. That’s important because you can’t redesign these [devices] easily.**

*Martin Murray, Honeywell*

**Honeywell’s proprietary micropressure platform is being used in unique and demanding applications.**

Honeywell’s micropressure platform provides proprietary Honeywell technology combining high sensitivity with high overpressure and burst. It has a small footprint (5mm x 5mm x 3mm) and industry-leading:

- **Stability** that retains performance characteristics over time and lowers customers’ system costs.
- **Total Error Band (TEB)** that supports system accuracy and warranty requirements.
- **Accuracy** of  $\pm 0.25\%$  FSS, which minimizes system level calibrations.

It is also insensitive to mounting orientation, which allows customers to optimally position the sensor in the system.

Applications of Honeywell’s micropressure platform include a hematology analyzer and laboratory automation, both of which require high throughput.

## BIOGRAPHIES

### **Alfredo Arteta**

Americas Product Manager, Healthcare Vertical, Honeywell

Alfredo Arteta is the Americas Product Manager for the Healthcare Vertical, responsible for the MEMS Pressure, Force and Humidity, and Temperature Products. With 16 years of experience in the Electronic Components Industry, he began his career at Mouser; first in Sales and then in Product Management, where he worked closely with Honeywell as their PM for nearly 9 years. After, he worked at ams/OSRAM with their Sales Operations Team for 2 years. In 2019, he joined Honeywell, working Inside Sales before moving to the Americas Product Manager role in August 2020.

### **Martin Murray**

Global Application Engineer, Honeywell

Martin Murray is a Global Application Engineer with 40 years of experience at Honeywell. Starting his career, he spent 7 years in sensor-testing and later spent 17 years in NPI Engineering, where he specialized in the design of electrical circuits for pressure and airflow sensors. He then transitioned into Application Engineering, where he has spent the last 16 years as the Applications Engineer for Pressure Force and Airflow Sensors.