# BREWING INNOVATION

# INTEGRATING PRESSURE SENSORS INTO NEXT-GEN COFFEE MAKERS

Application Brief

Honeywell

## OVERVIEW

The Honeywell ABP2 Series pressure sensors are highly suitable for integration into premium coffee and espresso machines. With an extended pressure range from 2.5 mbar to 20 bar (0.036 psi to 290 psi), these sensors can accurately monitor both low-pressure and high-pressure processes within coffee machines. Their food-grade compliance and compatibility with liquid media make them ideal for applications involving direct contact with water and steam.

## SENSOR PLACEMENT AND FUNCTIONALITY IN HIGH-END COFFEE AND ESPRESSO MACHINES

### Boiler Pressure Monitoring

In high-end espresso machines, maintaining precise boiler pressure is crucial for consistent steam generation and optimal brewing temperatures. The Honeywell ABP2 Series pressure sensors can be strategically installed on the boiler's steam outlet or within the steam chamber to monitor steam pressure accurately. These sensors are capable of operating effectively within a temperature range of -40°C to 110°C, making them suitable for the high-temperature environment of the boiler. By providing real-time pressure readings, the ABP2 sensors enable the maker's control system to regulate the heating element, ensuring that the steam pressure remains within the desired range, typically around 1.0 bar to 1.5 bar. This precise control not only enhances the quality of milk-based beverages by providing consistent steam for frothing but also improves safety by preventing over-pressurization of the boiler system.

### Brew Pressure Profiling

The extraction pressure during espresso brewing significantly influences the flavor and quality of the final beverage.

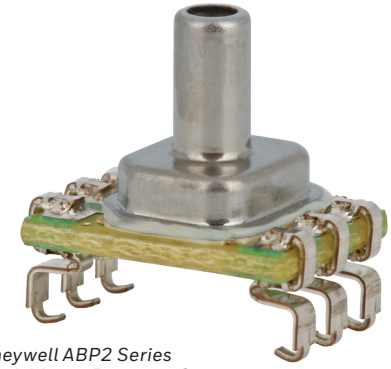
Integrating the ABP2 Series pressure sensors between the pump and the group head allows for precise monitoring and control of the brew pressure profile. These sensors offer a wide pressure measurement range, from as low as 2.5 mbar up to 20 bar, accommodating the typical espresso extraction pressures of 0 bar to 9 bar. With high accuracy (Total Error Band as low as ±1.5 %FSS) and fast response times (pressure and temperature readings updated at approximately 200 Hz), Honeywell ABP2 sensors enable dynamic pressure profiling throughout the extraction process. This capability allows baristas and automated systems to implement advanced brewing techniques, such as pre-infusion and pressure ramping, leading to enhanced flavor extraction and a more refined espresso experience.

### Water Line Pressure Monitoring

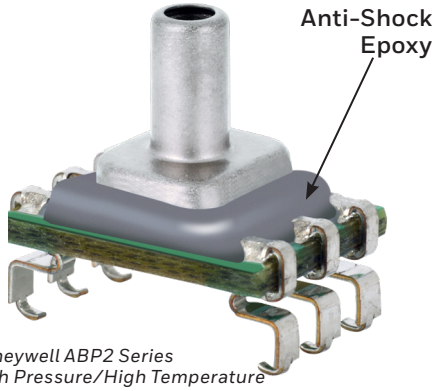
Stable water supply pressure is essential for consistent espresso extraction and overall machine performance. Installing the ABP2 Series pressure sensors at the water inlet enables continuous monitoring of incoming water pressure. These sensors are compatible with various liquid media, including water, due to their liquid media option featuring a protective gel coating that safeguards the electronics from moisture and condensation. By detecting fluctuations or drops in supply pressure, the sensor data can prompt the machine's control system to adjust pump operation or alert the user to potential issues, such as clogged filters or supply line problems. This proactive monitoring ensures that the machine operates within optimal parameters, maintaining beverage quality and reducing the risk of mechanical failures.

## SOLUTION

By incorporating the Honeywell ABP2 Series pressure sensors into these critical areas of high-end coffee and espresso machines, manufacturers can achieve precise control over brewing parameters, enhance beverage quality, and ensure reliable machine operation. The sensors' high accuracy, wide pressure range, and compatibility with food-grade applications make them an excellent choice for advanced coffee machine designs.



*Honeywell ABP2 Series Board-Mount Pressure Sensor*




*Honeywell ABP2 Series High Pressure/High Temperature Board-Mount Pressure Sensor*

## ADVANTAGES OF ABP2 SENSORS

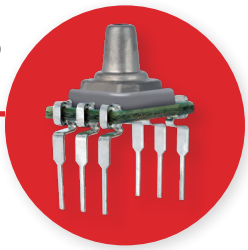
- **Wide Pressure Range:** 2.5 mbar to 20 bar (0.036 psi to 290 psi), accommodating various pressure monitoring needs within the machine.
- **High Accuracy:** Total Error Band as low as ±1.5 % Full Scale Span (FSS), ensuring precise pressure readings.
- **Temperature Resilience:** Operates effectively within -40°C to 110°C, suitable for the thermal conditions in coffee machines.
- **Digital and Analog Outputs:** Offers 24-bit digital ($I^2C$ or SPI) and ratiometric analog outputs for flexible integration with control systems.
- **Food-Grade Compliance:** Constructed with NSF-169, LFGB, and BPA-compliant materials, ensuring safety in food and beverage applications.
- **Liquid Media Compatibility:** Designed to handle non-corrosive liquids, including water and steam, without compromising sensor integrity.

## THE ADVANTAGE OF ABP2 HIGH TEMPERATURE/HIGH PRESSURE SENSORS

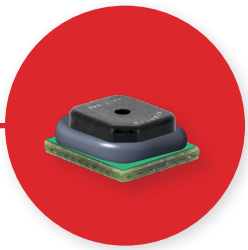
Selected ABP2 (ABP2 HP/HT release) pressure sensors intended for use within high pressure and/or high temperature applications have an extra layer of epoxy applied around the upper housing. This significantly increases the burst pressure and mitigates the risk of leakage when used within high pressure and high temperature applications. In addition this extra later of epoxy provides additional protection against vibration or shocks, e.g. when the sensor is used within an air compressor or when mounted near a motor or valve. When a motor is running there is often vibration, or when a valve open and closes, it can create a shock that may cause a pressure spike which, in turn, can damage sensors.

## SENSOR PLACEMENT

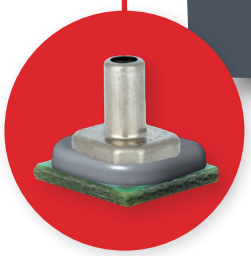
The Honeywell ABP2 HP/HT board-mount pressure sensor brings precision engineering and sleek design to the frontlines of gourmet espresso and coffee production. Its food-grade gel and epoxy-sealed housing ensure compliance and durability in contact with coffee oils and steam. Sleekly integrated into the machine's control board, the ABP2 sensors are strategically positioned. As the diagram illustrates, these Honeywell board-mount sensors work together to deliver fast, reliable pressure feedback that empowers advanced PID algorithms to elevate every shot. With its ultra-low power draw, miniature footprint, and legendary Honeywell quality, the ABP2 HP/HT isn't just a sensor—it's the core of next-generation espresso machines.



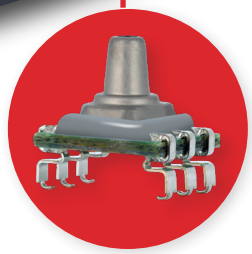
ABP2 HP/HT Pressure Sensors monitor boiling or brewing pressure (hot water)



ABP2 HP/HT Pressure Sensors can detect the water level in the coffee machine's tank (cold water)



By providing real-time pressure readings, the ABP2 sensors enable the maker's control system to regulate the heating element, ensuring that the steam pressure remains within the desired range.



Integrating the ABP2 Series pressure sensors between the pump and the group head allows for precise monitoring and control of the brew pressure profile.

## ⚠WARNING IMPROPER INSTALLATION

- Consult with local safety agencies and their requirements when designing a machine control link, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

**Failure to comply with these instructions could result in death or serious injury.**

## WARRANTY/REMEDY

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