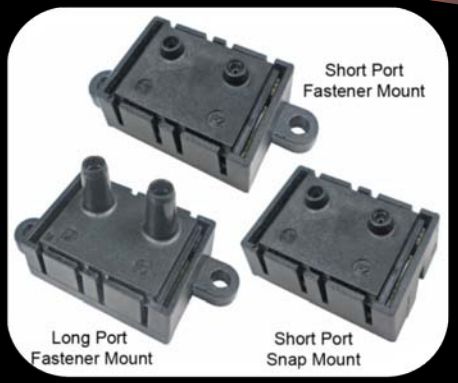
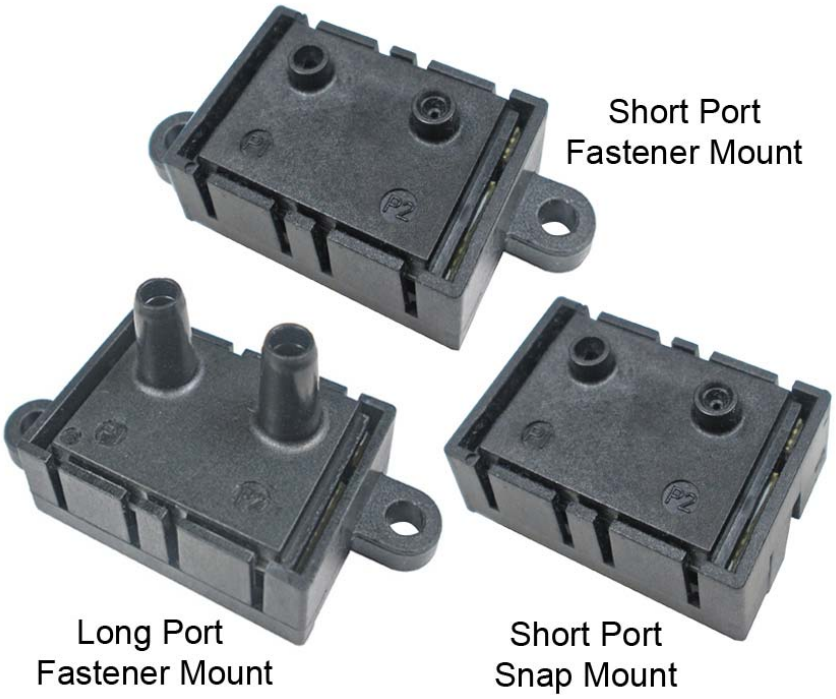
# PRODUCT TRAINING MODULE:
# Honeywell Zephyr™ Airflow Sensors
# HAF Series – High Accuracy




Honeywell

# Summary of Content

- **In this training module, you will learn the following about Honeywell Zephyr™ Airflow Sensors:**
  - The 6 advantages that are not found in other airflow sensors
  - Their key features and benefits
  - The Industrial and Medical applications in which they may potentially be used



# Introduction

- **Honeywell Zephyr™ Airflow Sensors, HAF Series (High Accuracy), provide enhanced functionality driven by our customers' product performance needs**
- **They offer Honeywell's customers 6 advantages that are not available in any other airflow sensor:**
  1. Industry-leading Total Error Band accuracy
  2. Industry-leading airflow range from ±50 SCCM to ±750 SCCM
  3. Industry-leading configurability
  4. Industry-leading stability
  5. Industry-leading low pressure drop
  6. Industry-leading linear output
- **We'll now review these advantages in detail, and the Medical and Industrial applications in which they may potentially be used**

# General Airflow Sensor Information

- **Honeywell Zephyr™ Airflow Sensors are designed to measure mass flow of air and other non-corrosive gases based on the heat transfer principle**
- **The thermally isolated heater and temperature sensing elements help provide a fast response to air or gas flow**
- **They consist of a Microelectromechanical System (MEMS) with temperature-sensitive resistors deposited with thin films of platinum and silicon nitride**
- **The MEMS sensing die is located in a precise and carefully designed airflow channel to provide repeatable response to flow**

# Value to Customers

- **Honeywell Zephyr™ offers 6 advantages to our customers not found in other airflow sensors available in the industry today**

## 1. Total Error Band (TEB) as low as ± 2.25%FSS★

- Honeywell specifies TEB—the most comprehensive measurement—that provides the sensor's true measurement performance over a compensated temperature range of -20 to 70 °C [-4 to 158 °F]
- TEB is the most meaningful measurement of accuracy because it is a single specification that includes all possible sources of error
- Allows for very precise airflow measurement
- Often ideal for demanding applications with high accuracy requirements

★ = competitive differentiator

**Industry-Leading Total Error Band Allows Precise Measurement**

# Value to Customers

## 2. Wide airflow range★

- Detects the presence or absence of airflow from ± 50 SCCM to ± 750 SCCM
- Allows customers that have already designed a bypass the ability to choose an airflow sensor to optimize their overall performance
  - A bypass is a path that is parallel to the main airflow channel that extends the flow range above the normal range of the airflow sensor
- Lower flow range sensors have high sensitivity that can help optimize performance in industrial applications such as gas leak detection and clogged HVAC air filter detection
- Higher airflow ranges can increase the customers' ability to integrate the sensor into applications that require higher flows

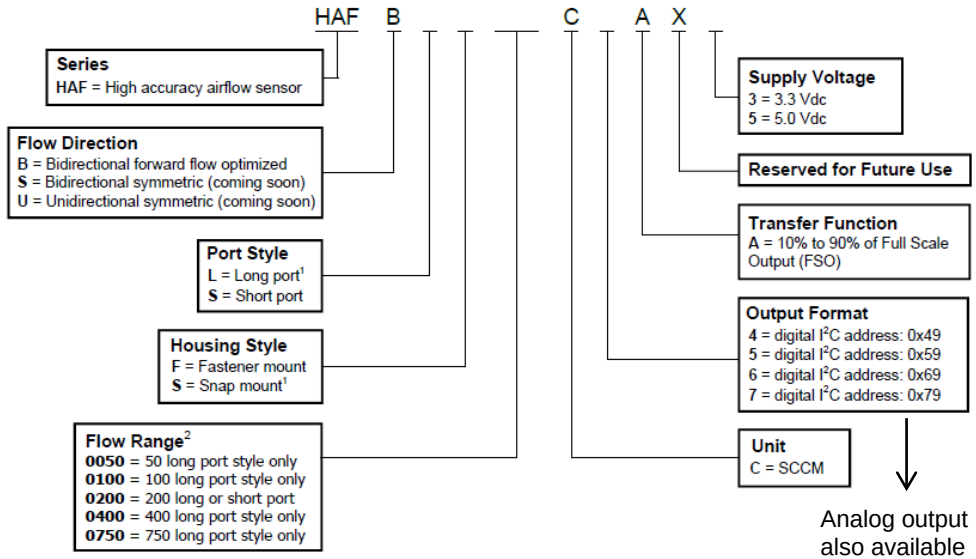
★ = competitive differentiator

**Wide Airflow Range from ±50 SCCM to ±750 SCCM**

# Value to Customers (continued)

## 3. Designed for configurability★

– A variety of options including flow direction, port style, housing style, flow range, supply voltage, and output format allows customers to configure the device to meet specific application needs




**Notes:**
1. The long port **port style** with the snap mount **housing style** is not a valid configuration.
2. The 200 SCCM flow range is available in the long and short port styles.

**Example Catalog Listing**
**HAFBLF0200C4AX5** = High accuracy airflow sensor, bidirectional forward flow optimized, long port style, fastener mount housing, 200 SCCM, digital I²C output with address 0x49, 10% to 90% transfer function, 5.0 Vdc supply voltage.

**Customer-specific Requirements**
Apart from the general configuration required, other customer-specific requirements are also possible. Please contact Honeywell.

★ = competitive differentiator

**Configurability Allows Customers to Meet Application Needs**

# Value to Customers (continued)

**4. High stability★**
- Reduces errors due to thermal effects and null shift for accurate readings over time
- Often eliminates the need for system calibration after PC board mount and periodically over time

**5. Low pressure drop★**
- Important in medical and industrial applications to allow the system to operate quietly with less wear on system components

**6. Linear output★**
- Provides a more intuitive sensor signal than the raw output of basic airflow sensors
- Can help reduce production costs, design, and implementation time

**★ = competitive differentiator**

High Stability; Low Pressure Drop; Linear Output

# Features and Benefits

- **Fully calibrated and temperature compensated**
  - Typically allows the customer to remove additional components associated with signal conditioning from the PC board
  - Reduces PC board size as well as costs often associated with those components, such as acquisition, inventory, and assembly
- **Fast 1 ms response time**
  - Allows the end-customer's application to respond quickly to airflow change, important in critical medical applications, such as anesthesia machines, and industrial applications, such as fume hoods
- **High 11-bit resolution**
  - Increases the ability to sense small airflow changes
  - Allows customers to more precisely control their application
- **Low 3.3 Vdc operating voltage option and low power consumption**
  - Allows for use in battery-driven and other portable applications

# Features and Benefits (continued)

- **Bidirectional flow sensing capability**
  - Eliminates the need for two airflow sensors
  - Helps reduce production costs and implementation time
- **Insensitivity to mounting orientation**
  - Allows customers to position the sensor in the optimal point in system
  - Eliminates concern for positional effects
- **Insensitivity to altitude**
  - Eliminates customer-implemented altitude adjustments in the system
  - Eases integration and reduces production costs by not having to purchase additional sensors for altitude adjustments
- **Small size**
  - Occupies less space on the PC board
  - Eases fit
  - Potentially reduces production costs
- **RoHS-compliant materials**
  - Meet Directive 2002/95/EC

# Honeywell Airflow Sensor Portfolio

- **Honeywell offers a broad airflow sensor portfolio**

| |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
| | **Honeywell Zephyr™ HAF Series** | **AWM1000 Series** | **AWM2000 Series** | **AWM3000 Series** | **AWM5000 Series** | **AWM700 Series** | **AWM40000 Series** | **AWM90000 Series** |
| **Signal conditioning** | Amplified | Unamplified | Unamplified | Amplified | Amplified | Amplified | Unamplified or amplified | Unamplified |
| **Technology** | Silicon die with thermally isolated heater | Silicon die | Silicon die | Silicon die | Silicon die | Silicon die | Silicon die | Silicon die |
| **Flow/ pressure range** | ±50 to ±750 SCCM | ± 200, 1000 to -600 SCCM, ± 5,0 mbar [2.0 in H2O], ± 10,0 mbar [4.0 in H2O] | ± 30 SCCM, ± 1000 SCCM, ± 10,0 mbar [4.0 in H2O] | 30, 200, 1000 SCCM; 0 to 1,25 mbar [0 to 0.5 in H2O], 0 to 5, mbar [0 to 2 in H2O], 5,m0 mbar [2.0 in H2O] | 0 to 5,0 0 to 10,0 9 to 15,0 0 to 20,0 SLPM | 200 SLPM | ± 25,0 SCCM, 1,0 SLPM, 6,0 SLPM | ± 200 SCCM, ± 5,0 mbar [2.0 in H2O] |
| **Power usage** | 23 mW typ. at 3.3 Vdc; 38 mW typ. at 5.0 Vdc | 30 mW typ. | 30 mW typ. | 50 mW or 100 mW typ. | 100 mW max. | 60 mW max. | 60 mW max., 75 mW max. | 50 mW typ. |
| **Port style** | Long port & short port fastener mounts; short port snap mount | Straight | Straight | Straight | 1/4 in-18 NPT | 22 mm tapered | Manifold | Parallel |
| **Media capability** | Air & non-corrosive dry gases | Dry gas only | Dry gas only | Dry gas only | Dry gas only | Dry gas only | Dry gas only | Dry gas only |
| **Operating temp range** | -20 to 70 °C [-4 to 158 °F] | -25 to 85 °C [-13 to 185 °F] | -25 to 85 °C [-13 to 185 °F] | -25 to 85 °C [-13 to 185 °F] | -20 to 70 °C [-4 to 158 °F] | -25 to 85 °C [-13 to 185 °F] | -40 to 125 °C [-40 to 251 °F] | -25 to 85 °C [-13 to 185 °F] |

# Potential Industrial Applications

- **Honeywell Zephyr™ Airflow Sensors may potentially be used in numerous Industrial applications, including:**
  - Air-to-fuel ratio
  - Gas leak detection
  - HVAC filters
  - Analytical instrumentation
  - Fuel cells
  - Gas meters
  - VAV (Variable Air Volume) systems


Air to fuel ratio


Gas leak detection


HVAC filters


Analytical instrumentation


Fuel cells

Gas meters


VAV systems

# Potential Medical Applications

- **Honeywell Zephyr™ Airflow Sensors may potentially be used in numerous Medical applications, including:**
  - Anesthesia delivery machines
  - Sleep apnea machines
  - Ventilators
  - Oxygen concentrators
  - Nebulizers
  - Spirometers
  - Hospital diagnostics
  - Patient monitoring
  - Ventricular assist devices (heart pumps)


Anesthesia delivery machines


Sleep apnea machines


Ventilators

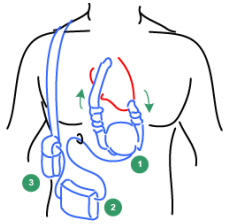

$O^2$ concentrators


Nebulizers


Spirometers

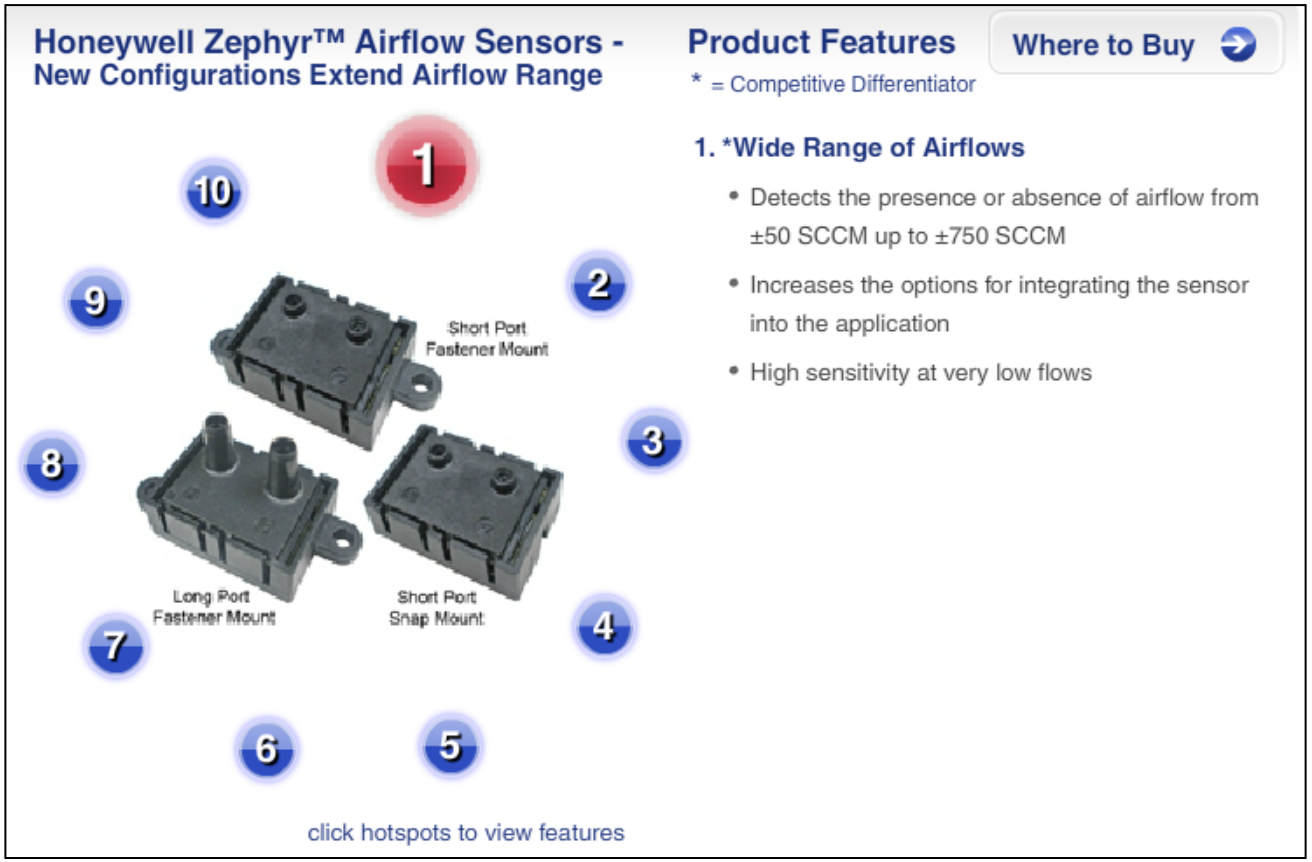

Diagnostic equipment


Patient monitoring


Ventricular assist devices

# Zephyr Airflow Sensors – Online Resources

- **Interested in more information? Click here:**




www.honeywell.com/sensing

# About Honeywell Sensing and Control Products

- **For more information about all of Honeywell Sensing and Control sensor and switch solutions, visit www.honeywell.com/sensing**