

## Honeywell Zephyr™ Digital Airflow Sensors

HAF Series—High Accuracy: 10 SLPM, 15 SLPM, 20 SLPM, 50 SLPM, 100 SLPM, 200 SLPM, 300 SLPM

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Issue 5

Datasheet



### DESCRIPTION

Honeywell Zephyr™ HAF Series sensors provide a digital interface for reading airflow over specified full-scale flow and compensated temperature ranges. The thermally isolated heater and temperature sensing elements help these sensors provide a fast response to air or gas flow. Zephyr sensors are designed to measure mass flow of air and other non-corrosive gases. Standard flow ranges are 10 SLPM, 15 SLPM, 20 SLPM, 50 SLPM, 100 SLPM, 200 SLPM and 300 SLPM, with custom flow ranges available. The sensors are fully calibrated and temperature compensated with an onboard Application Specific Integrated Circuit (ASIC). The HAF Series >10 SLPM is compensated over the calibrated temperature range of 0°C to 50°C [32°F to 122°F]. The state-of-the-art ASIC-based compensation provides digital (I<sup>2</sup>C) outputs with a response time of 1 ms. These sensors operate on the heat transfer principle to measure mass airflow. They consist of a microbridge Microelectronic and 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. Zephyr sensors provide the customer with enhanced reliability, high accuracy, repeatable measurements and the ability to customize sensor options to meet many specific application needs. The combination of rugged housings with a stable substrate makes these products extremely robust. They are designed and manufactured according to ISO 9001 standards.

### VALUE TO CUSTOMERS

- **Precise measurement:** The industry's smallest Total Error Band, fast response time, and high accuracy provide precise measurement and high performance in the customer's application.
- **Saves time:** Configurable and customizable with a choice of port styles simplifies design and reduces production time.
- **Cost-effective:** Reduces printed circuit board (PCB) size and overall design and production costs.

### FEATURES

- Fast response time (1 ms) allows the customer's application to respond quickly to a change in airflow, important in critical medical (e.g., anesthesia) and industrial (e.g., fume hood) applications.
- High stability reduces errors due to thermal effects and null shift, providing accurate readings over time and often eliminating the need for system calibration after PCB mount and periodically over time.
- High sensitivity at very low flows provides a fast response time at the onset or cessation of flow.
- High 12-bit resolution increases the ability to sense small airflow changes, allowing customers to more precisely control their application.
- Wide airflow range: The industry's broadest airflow range measures mass flow with standard flow ranges of 0 to 10, 0 to 15, 0 to 20, 0 to 50, 0 to 100, 0 to 200 and 0 SLPM to 300 SLPM, or custom flow ranges, increasing the options to integrate the sensor into the application.
- Choice of port styles: Manifold mount, 22 mm OD tapered male fitting, and G 3/8 female threaded fitting provide flexibility to choose the pneumatic connection that is best for the customer's application.
- Linear output provides a more intuitive sensor signal than the raw output of basic airflow sensors, which can help reduce production costs, design, and implementation time.
- Wide supply voltage range (3 Vdc to 10 Vdc) provides a flexible regulated power circuit which allows the designer the flexibility to choose the supply voltage that works best in the system.
- ASIC-based I<sup>2</sup>C digital output simplifies integration to microprocessors or microcontrollers, reducing PCB complexity and component count.
- RoHS-compliant materials Meet Directive 2002/95/EC.

### POTENTIAL APPLICATIONS

- **Medical:** Anesthesia delivery machines, ventilators, ventricular assist devices (heart pumps), spirometers, laparoscopy
- **Industrial:** Analytic instrumentation (spectrometry, chromatography), air-to-fuel ratio, fuel cells, fume hoods, gas leak detection, process control gas monitoring, vacuum pump monitoring

### PORTFOLIO

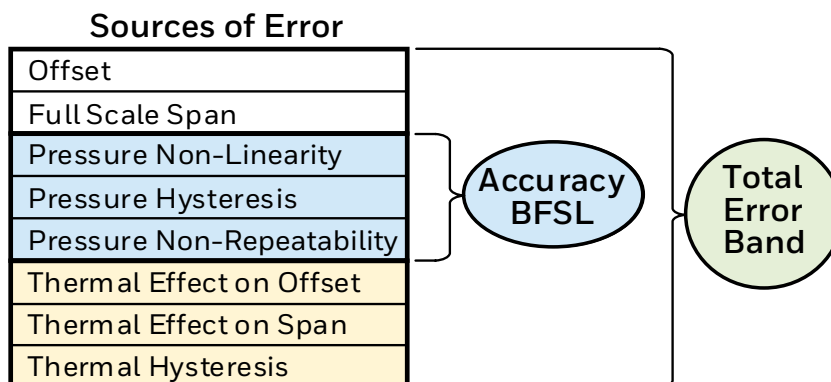
The Honeywell Zephyr Digital Airflow Sensors join an extensive line of airflow sensors for potential use in medical, industrial, and consumer applications.

# Honeywell Zephyr™ Digital Airflow Sensors

## HAF Series—High Accuracy: 10, 15, 20, 50, 100, 200, 300 SLPM

**Figure 1. Total Error Band vs. Accuracy**

Other airflow sensor manufacturers only report on accuracy, while Honeywell reports Total Error Band.



### HIGH ACCURACY

Ideal for use in demanding applications that require high accuracy.

- 0%FS to 14.3%FS = 0.5%FS
- 14.3%FS to 100%FS = 3.5%reading

### TOTAL ERROR BAND (TEB)\*

Honeywell specifies TEB, the most comprehensive, clear, and meaningful measurement that provides the sensor's true accuracy (see Figure 1). TEB allows for precise airflow measurement, often ideal for demanding applications with high accuracy requirements for precise airflow measurement.

- 10, 15, 20, 50, 100, 200 SLPM:
  - 0%FS to 12.5%FS = 0.5%FS
  - 12.5%FS to 100%FS = 4.0%reading
- 300 SLPM only:
  - 0%FS to 12.5%FS = 0.5%FS
  - 12.5%FS to 66.7%FS = 4.0%reading
  - 66.7%FS to 100%FS = 7.0%reading

**Table 1. Absolute Maximum Ratings<sup>1</sup>**

Characteristic	Parameter
Supply voltage	-0.3 Vdc to 11.0 Vdc
Voltage on digital I/O output pins	-0.3 Vdc to 3.0 Vdc <sup>2</sup>
Storage temperature range	-40°C to 100°C [-40°F to 212°F]
Maximum flow change	10,000 SLPM/s
Maximum common mode pressure	4 bar   60 psi at 25°C [77°F]
Maximum flow	350 SLPM

<sup>1</sup>Absolute maximum ratings are the extreme limits that the device will withstand without damage to the device. However, the electrical and mechanical characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached, nor will the device necessarily operate at absolute maximum ratings.

<sup>2</sup>Digital I/O pins are diode protected at this voltage up to 2 mA. Digital bus voltage may exceed this value if the maximum digital bus current is limited to 2 mA or less. The maximum bus current is generally determined by the bus pull-up resistors

### CAUTION IMPROPER USE

Do not use these products to sense liquid flow.  
**Failure to comply with these instructions may result in product damage.**

### CAUTION PRODUCT DAMAGE

Do not disassemble these products.  
**Failure to comply with these instructions may result in product damage.**