Honeywell

Application Note

Honeywell Zephyr™ Analog and Digital Airflow Sensors: HAF Series-High Accuracy, ±50 SCCM to ±750 SCCM

Solutions

Honeywell's Zephyr™ Analog and Digital Airflow Sensors: HAF Series-High Accuracy sensors provide an analog or digital interface for reading airflow over the specified full-scale flow span and temperature range. 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 available from ±50 SCCM to ±750 SCCM. The sensors are fully calibrated and temperature compensated with an onboard Application Specific Integrated Circuit (ASIC).

POTENTIAL MEDICAL APPLICATIONS

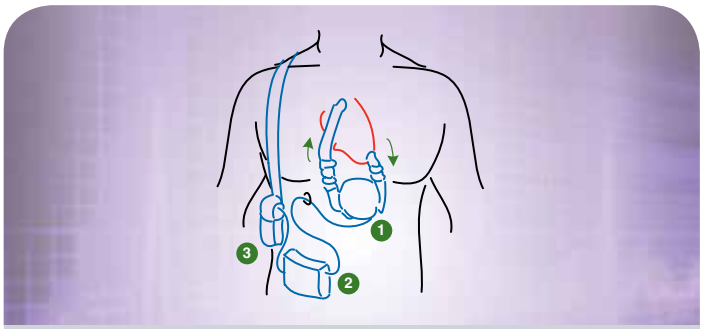
Anesthesia Delivery Machines measure the flow of air, oxygen and nitrous oxide so that a specified mixture, as set by the doctor, is delivered to the patient.

Customer Benefits: Improves patient comfort and eases patient breathing; reliable and accurate.

Ventricular Assist Devices (Heart Pumps) are mechanical pumps that assist the heart by pumping blood to the rest of the body for patients with congestive heart failure. Almost all VADs are made up of three parts:

1. Pump: A pump is placed inside or outside the body, and is connected to the heart by a tube. Blood travels from the heart, down the inflow tube, and into the VAD. The VAD then pumps the blood into the outflow tube and delivers it to a major blood vessel.
2. Controller: A system controller is placed outside the body to control the VAD. The Honeywell Zephyr™ Digital Airflow Sensor may be used in the controller to measure the flow of air so that the correct amount of air is delivered to the pump that drives blood flow through the heart. The VAD and the controller are connected by a cord that exits the body via an opening on the side of the abdomen.
3. Energy source: An outside energy source, either an AC power adapter or a battery pack, powers the pump.

Anesthesia delivery machine



Ventricular assist device


Hospital diagnostics


Nebulizer

Application Note

Honeywell Zephyr™ Analog and Digital Airflow Sensors: HAF Series-High Accuracy, ±50 SCCM to ±750 SCCM

Customer Benefits: Highly accurate, sensitive and stable; low pressure drop typically improves patient comfort; fast response time improves response to airflow change; low operating voltage and power consumption enhance portability

Hospital Diagnostics (Spectrometry, Gas Chromatography) regulate the flow rate to eliminate outgasing.

Customer Benefits: Reliable, reduces the risk of contamination, accurate, stable and easy to implement.

Nebulizers convert liquid medication to a mist so it can be more easily inhaled into the lungs, often ideal for infants or small children. Honeywell's airflow sensors help to deliver a specified concentration of medication.

Customer Benefits: Improves patient comfort; reliable and accurate.

Oxygen Concentrators detect ultra-low levels at 0.1 cm^3 to detect when the patient exhales and when the system should reduce airflow.

Customer Benefits: Improves patient comfort and eases patient breathing; quiet, portable and reliable.

Patient Monitoring Systems (Respiratory Monitoring) monitor the patient's respiratory function.

Customer Benefits: Improves measurement sensitivity and accuracy; portable and reliable.

Sleep Apnea Machines monitor the patient's breathing and send an output that can be used to reduce the flow of its internal blower fan when the patient starts to exhale.

Customer Benefits: Improves patient comfort and eases patient breathing; quiet, portable and reliable.

Oxygen Concentrator

Patient Monitoring System

Sleep Apnea Machine

Spirometer

Application Note

Honeywell Zephyr™ Analog and Digital Airflow Sensors: HAF Series-High Accuracy, ±50 SCCM to ±750 SCCM

Spirometers are instruments that measure lung capacity for patients with respiratory disorders. Honeywell's airflow sensor measures the airflow from the patient on exhalation.

Customer Benefits: Sensitive, accurate and reliable.

Ventilators measure the flow of air, oxygen and nitrous oxide so that a specified mixture, as set by the doctor, is delivered to the patient.

Customer Benefits: Improves patient comfort and eases patient breathing; reliable.

POTENTIAL INDUSTRIAL APPLICATIONS

Air-to-Fuel Ratio is the mass ratio of air to fuel present during combustion. In air-fuel ratio sensing applications, such as fired heaters, power plant steam generators and large gas-fired turbines, Honeywell's airflow sensors may be used to control the mixture of air and fuel to optimize operation.

Customer Benefits: Improves accuracy and reliability.

Analytical Instrumentation (Spectrometry, Chromatography) includes equipment used in the analysis of solid materials, gases or chemical compounds in many industrial, scientific, environmental and security applications. Spectrometry assesses the amount of a given chemical, while chromatography separates mixed chemical substances. These applications require precise control for accurate measurement. Honeywell's airflow sensor measures the gas flowing through the instrument to validate that the correct amount of gas is flowing through the system, and then notifies the machine if it is not correct so that the machine can compensate. The flow rate eliminates outgasing and provides the most accurate result for the instrument.

Customer Benefits: Improves accuracy, reliability and stability.

Fuel Cells are chemically-generated energy that require controlled amounts of air or gas to optimize operation. Honeywell's airflow sensor enables precise control over the different gases involved in the fuel cell system to optimize performance.

Customer Benefits: Improves accuracy, reliability and stability.

Ventilator

Air-to-Fuel Ratio

Analytical Instrumentation

Fuel Cells

Application Note

Honeywell Zephyr™ Analog and Digital Airflow Sensors: HAF Series-High Accuracy, ±50 SCCM to ±750 SCCM

Gas Leak Detection is possible with the use of airflow sensors on a gas meter to find small amounts of gas flow so that even the smallest leaks in a gas system are reported.

Customer Benefits: Provides accurate reporting and enhances safety.

VAV System is a variable air volume (VAV) system within an HVAC system is a means of varying the amount of conditioned air in different parts of the building to meet its heating and cooling needs. Honeywell's airflow sensor helps determine the precise amount of air going through the ductwork to allow precise adjustment of airflow into rooms. Honeywell's airflow sensor is designed to detect flow at a very low pressure level (2 inH_2O or less).

Customer Benefits: Helps improve occupant comfort.

Gas Meters are used to measure the volume of natural gas and propane used at residential, commercial and industrial buildings that consume fuel gas. Honeywell's airflow sensor measures the precise amount of gas used to provide accurate information for reporting needs.

Customer Benefits: Provides enhanced accuracy and reliability.

HVAC Filters require proper maintenance, because it is crucial to keeping HVAC ductwork clean. If dirt accumulates in the ductwork and relative humidity reaches the dewpoint level, leading to condensation, then bacteria and mold may grow. Honeywell's airflow sensor may be used to inform the HVAC system when the filter is clogged so that it can be changed. The sensor is designed to detect flow at a very low pressure level (2 inH_2O or less).

Customer Benefits: Helps the HVAC system produce cleaner, purer air, reduces indoor air quality-related problems and improves energy efficiency.

Gas Leak Detection

VAV System on HVAC Systems

Gas Meter

HVAC Filter

Application Note

Honeywell Zephyr™ Analog and Digital Airflow Sensors: HAF Series-High Accuracy, ±50 SCCM to ±750 SCCM

Zephyr™ Analog and Digital Airflow Sensors: HAF Series-High Accuracy, ±50 SCCM to ±750 SCCM	**Features and Benefits** (★ = competitive differentiator)
	★ Total Error Band (TEB) as low as ±0.25 %FSS allows for precise airflow measurement, often ideal for demanding applications with high accuracy requirements Wide range of airflows: ★ Fast response time allows a customer's application to respond quickly to airflow change, important in critical medical (e.g., anesthesia) and industrial (e.g., fume hood) applications ★ Wide range of airflows: Zephyr measures mass flow at standard flow ranges of ±50, ±100 ±200, ±400 or ±750 SCCM, or custom flow ranges, increasing the options for integrating the sensor into the application ★ Customizable flow ranges and configurable package styles to meet specific end-user needs • Full calibration and temperature compensation typically allow the customer to remove additional components associated with signal conditioning from the PCB, reducing PCB size as well as costs often associated with those components (e.g., acquisition, inventory, assembly) • High sensitivity at very low flows provides for faster response time at the onset or cessation of flow ★ Linear output provides more intuitive sensor signal than the raw output of basic airflow sensors, which can help reduce production costs, design, and implementation time ★ High stability reduces errors due to thermal effects and null shift to provide accurate readings over time, often eliminating need for system calibration after PCB mount and periodically over time ★ Low pressure drop typically improves patient comfort in medical applications, and reduces noise and system wear on other components such as motors and pumps • 0.039 %FS resolution (analog version) or high 12-bit resolution (digital version) increases ability to sense small airflow changes, allowing customers to more precisely control their application • Low 3.3 Vdc operating voltage option and low power consumption allow for use in battery-driven and other portable applications • ASIC-based I²C digital output (digital version) compatibility eases integration to microprocessors or microcontollers, reducing PCB complexity and component count. • Insensitivity to mounting orientation allows customer to position sensor in most optimal point in the system, eliminating concern for positional effects • Insensitivity to altitude eliminates customer-implemented altitude adjustments in the system, easing integration and reducing production costs by not having to purchase additional sensors for altiitude adjustments • Small size occupies less space on PCB, allowing easier fit and potentially reducing production costs; PCB size may also be reduced for easier fit • RoHS-compliant materials meet Directive 2002/95/EC

Find out more

To learn more about Honeywell's sensing and control products, call **1-800-537-6945**, visit **sensing.honeywell.com** or e-mail inquiries to **info.sc@honeywell.com**

Sensing and Control
Honeywell
1985 Douglas Drive North
Golden Valley, MN 55422
sensing.honeywell.com

Honeywell

008203-4-EN IL50 GLO
December 2012