

## Interactive Catalog Replaces Catalog Pages

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### **Sensing and Control**

Honeywell Inc.

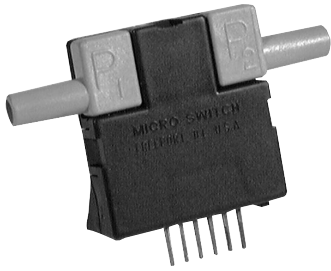
11 West Spring Street

Freeport, Illinois 61032

# Airflow Sensors

## Microbridge Mass Airflow/Unamplified

AWM 2000 Series



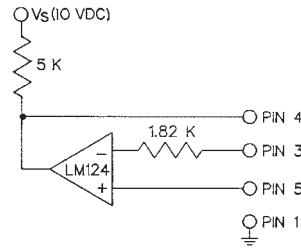
### FEATURES

- Bidirectional sensing capability
- Actual mass air flow sensing
- Low differential pressure sensing

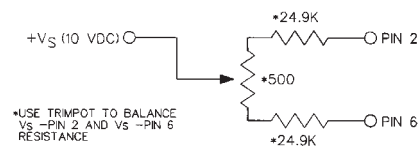
The AWM2000 Series microbridge mass airflow sensor is a passive device comprised of two Wheatstone bridges. The heater control circuit in Figure 1 is required for operation per specifications. The sensing bridge supply circuit in Figure 2 is also required for operation per specifications. These two circuits are **not on board** the package and must be supplied in the application. The differential amplifier in Figure 3 is a useful interface for the sensing bridge. It can be used to introduce the gain and to introduce voltage offsets to the sensor output as referenced in Equation 1.

**Note:** For applications sensing hydrogen or helium, see Application Note 3, page 131.

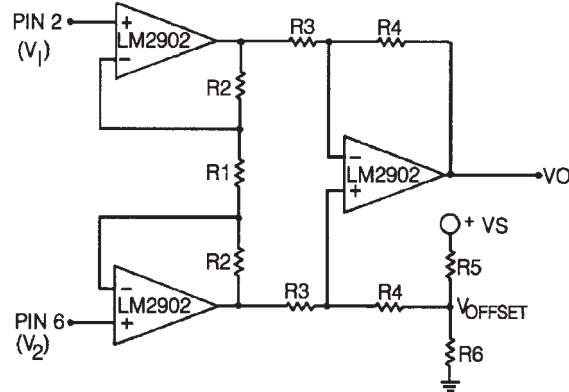
**Figure 1**  
**Heater Control Circuit**



**Figure 2**  
**Sensing Bridge Supply Circuit**



**Figure 3**  
**Differential Instrumentation Amplifier Circuit**



**Equation 1:**

$$V_o = \left( \frac{2R_2 + R_1}{R_1} \right) \left( \frac{R_4}{R_3} \right) (V_2 - V_1) + V_{\text{offset}}$$

$$\text{where } V_{\text{offset}} = V_s \left( \frac{R_6}{R_5 + R_6} \right)$$

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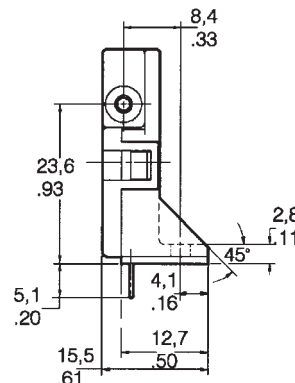
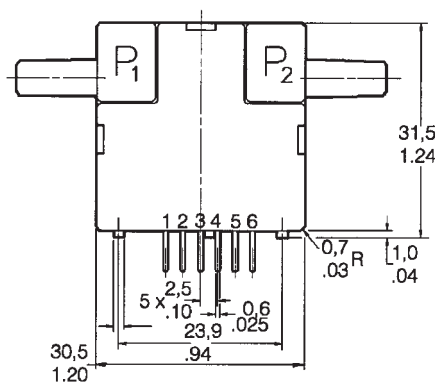
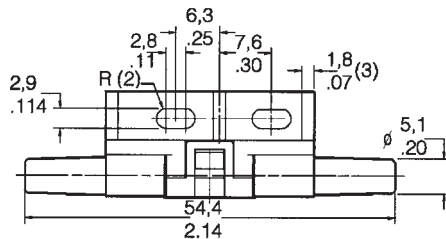
AWM2000 Series

### AWM2000 SERIES ORDER GUIDE (Performance Characteristics @ 10.01 ±0.01 VDC, 25°C)

Catalog Listings	AWM2100V	AWM2150V	AWM2200V	AWM2300V
Flow Range (Full Scale)	±200 sccm	±30 sccm		±1000 sccm
Pressure Range (See Application Note #1)			±4.0" H <sub>2</sub> O (10 mBar)	
Output Voltage @ Trim Point	30 mV @ 100 sccm	11.8 mV @ 25 sccm	20 mV @ 2" H <sub>2</sub> O	50 mV @ 650 sccm
Null Voltage Shift, Typ. +25° to -25°C, +25° to 85°C	±0.20 mV	±0.20 mV	±0.20 mV	±0.20 mV
Output Voltage Shift, Max. +25° to -25°C +25° to +85°C	+2.5% Reading -2.5% Reading	+5% Reading -5% Reading	+22% Reading (Note 2) -22% Reading	+5% Reading -5% Reading
Repeatability & Hysteresis, Max.	±0.35% Reading	±0.35% Reading	±0.35% Reading	±1% Reading
	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	
Excitation (VDC) (Note 1)	8.0	10±0.01	15	
Power Consumption (mW)	—	30	50	
Null Voltage (mV)	-1.0	0.0	+1.0	
Response Time (msec)	—	1.0	3.0	
Common Mode Pressure (psi)	—	—	25	
Sensor Resistance (kΩ) Pin 2-Pin 1, Pin 6-Pin 1	—	5	—	
Sensor Current (mA) Pin 2-Pin 1, Pin 6-Pin 1	—	—	0.6	
Temperature Range	Operating: -25° to +85°C (-13° to +185°F); Storage: -40° to +90°C (-40° to +194°F)			
Termination	2,54 mm (.100") centers, 0,635 mm (0.025") square			
Weight (grams)	10.8			
Shock Rating	100 g peak (5 drops, 6 axes)			

- Notes:**
- Output Voltage is ratiometric to supply voltage.
  - Temperature shifts when sensing differential pressure correlates to the density change of the gas over temperature. See Application Note 1.
  - Maximum allowable rate of flow change to prevent damage: 5.0 SLPM/1.0 sec.

### MOUNTING DIMENSIONS (for reference only)



**NOTE:** Positive flow direction is defined as proceeding from Port 1 (P1) to Port 2 (P2) and results in positive output (Pin 6 > Pin 2). Negative flow direction is defined conversely and results in negative output (Pin 6 < Pin 2). Do not exert a force greater than 4.54 kg (10 lbs.) in any direction.

Airflow

# Airflow Sensors

## Microbridge Mass Airflow/Unamplified

AWM2000 Series

### OUTPUT FLOW VS INTERCHANGEABILITY (Note 1)

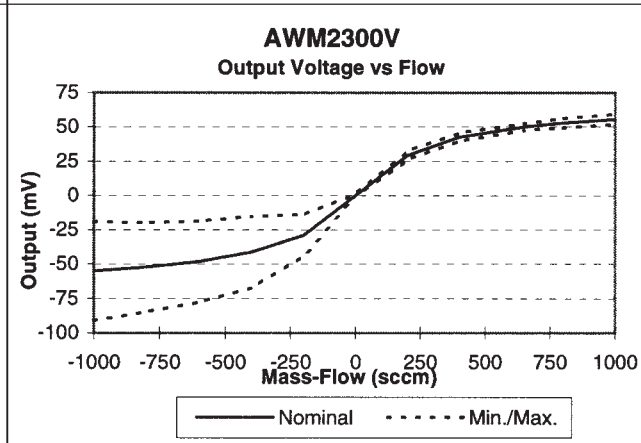
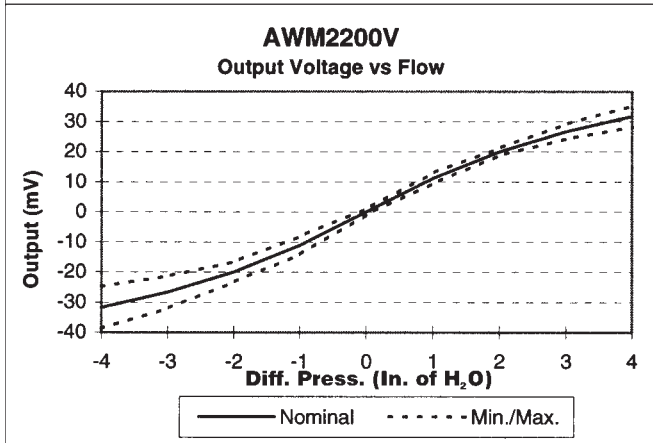
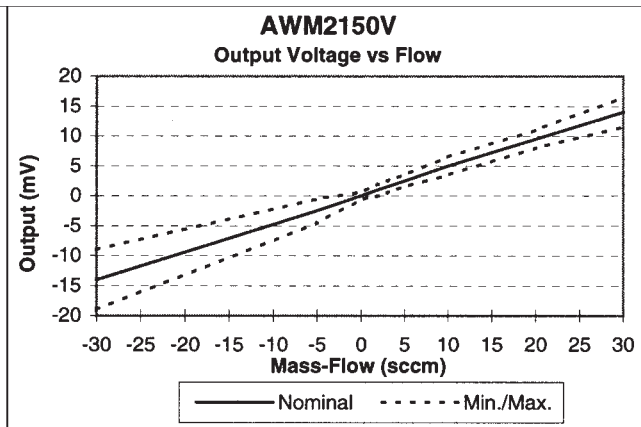
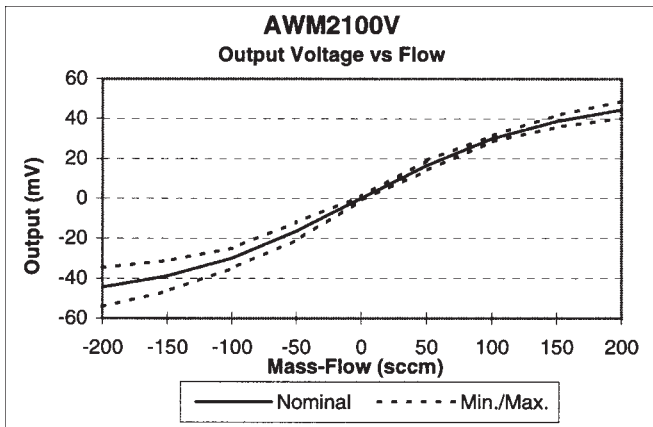
Performance Characteristics @ 10.0 ±0.01 VDC, 25°C

AWM2100V				AWM2150V				AWM2200V (Note 2)				AWM2300V			
Press. mBar	Flow sccm	Nom. mV	Tol. ±mV	Press. μBar	Flow sccm	Nom. mV	Tol. ±mV	Flow sccm	Press. " H <sub>2</sub> O	Nom. mV	Tol. ±mV	Press. mBar	Flow sccm	Nom. mV	Tol. ±mV
0.49	<b>200</b>	44.50	4.25	53	<b>30</b>	14.0	2.5	120	<b>4.00</b>	31.75	3.50	3.4	<b>1000</b>	55.50	3.70
0.35	<b>150</b>	38.75	3.00	36	<b>20</b>	9.5	1.5	90	<b>3.00</b>	26.75	2.50	2.4	<b>800</b>	52.90	3.50
0.21	<b>100</b>	30.00	1.50	17	<b>10</b>	5.0	1.5	60	<b>2.00</b>	20.00	1.20	1.8	<b>650</b>	50.00	2.50
0.09	<b>50</b>	16.50	2.50	9.8	<b>5</b>	2.5	1.0	30	<b>1.00</b>	11.20	1.80	0.83	<b>400</b>	42.50	3.00
0.00	<b>0</b>	0.00	1.00	7.4	<b>4</b>	2.0	1.0	0	<b>0.00</b>	0.00	1.00	0.31	<b>200</b>	29.20	3.20
-0.09	<b>-50</b>	-16.50	4.50	6.2	<b>3</b>	1.5	1.0	-30	<b>-1.00</b>	-11.20	3.00	0	<b>0</b>	0.00	1.00
-0.21	<b>-100</b>	-30.00	5.00	5	<b>2</b>	1.0	1.0	-60	<b>-2.00</b>	-20.00	3.30	-0.31	<b>-200</b>	-28.90	15.00
-0.35	<b>-150</b>	-38.80	7.65	2.5	<b>1</b>	0.5	0.8	-90	<b>-3.00</b>	-26.75	5.30	-0.83	<b>-400</b>	-41.20	26.00
-0.49	<b>-200</b>	-44.50	9.75	0	<b>0</b>	0.0	0.6	-120	<b>-4.00</b>	-31.75	7.00	-1.6	<b>-600</b>	-48.20	29.50
				-9.8	<b>-5</b>	-2.5	2.0					-2.4	<b>-800</b>	-52.20	32.50
				-53	<b>-30</b>	-14.0	5.0					-3.4	<b>-1000</b>	-55.00	36.00

### Notes:

- Numbers in **BOLD** type indicate calibration type, mass flow or differential pressure. Tolerance values apply to calibration type only.
- Differential pressure calibrated devices are not recommended for flow measurement. Use flow calibrated devices for flow measurement.

### OUTPUT CURVES



# Microbridge Airflow Sensors

## Gas Media Compatibility – Note #4

The microbridge mass airflow sensor incorporates a limited number of wetted materials in the construction of the device. The wetted materials in the sensor are fairly non-reactive and are compatible with a wide variety of gaseous media. Table 1 and Table 2 list wetted sensor materials and associated media compatibility.

### NOTICE

Filtering is highly recommended for use in applications that may contain dust particle contamination that can degrade sensor performance over time. See Particle Contamination and Filter Manufacturers, page 126, for more information.

### CAUTION

#### PRODUCT DAMAGE

AWM Series microbridge mass airflow sensors are **NOT** designed to sense liquid flow and will be damaged by liquid flow through the sensor.

### MICROBRIDGE—WETTED SENSOR MATERIALS

Sensor material	AWM1000	AWM2000	AWM3000	AWM40000	AWM5000
Silicon	X	X	X	X	X
Silicon nitride	X	X	X	X	X
Gold	X	X	X	X	X
Aluminum oxide	X	X	X	X	X
Epoxy sealant	X	X	X	X	X
Fluorocarbon				X	X
Polyester					X
Polyetherimide	X	X	X	6 SLPM Only	
316 Stainless steel	AWM1200V	AWM2200V	AWM3200V		

### MICROBRIDGE—GAS MEDIA COMPATIBILITY

Gas Media	AWM1000	AWM2000	AWM3000	AWM40000	AWM5000
Air	X	X	X	X	X
Nitrogen	X	X	X	X	X
Oxygen	X	X	X	X	X
Argon	X	X	X	X	X
Helium	15 VDC Supply	15 VDC Supply	15 VDC Supply	15 VDC Supply	15 VDC Supply
Hydrogen*	Special listing	Special listing	Special listing	Special listing	Special listing
Natural Gas	X	X	X	X	X
Nitrous oxide	X	X	X	X	X
Anesthetic Gasses	N/A	N/A	N/A	N/A (Except 6 SLPM)	X
Carbon dioxide	X	X	X	X	X
Nitric oxide	Dry Gas Only	Dry Gas Only	Dry Gas Only	Dry Gas Only	Dry Gas Only
Sulfur oxide	Dry Gas Only	Dry Gas Only	Dry Gas Only	Dry Gas Only	Dry Gas Only
Water vapor	Non-Condensing	Non-Condensing	Non-Condensing	Non-Condensing	Non-Condensing
Ammonia gas	Dry Gas Only, <1%	Dry Gas Only, <1%	Dry Gas Only, <1%	Dry Gas Only, <1%	Dry Gas Only, <1%
Chlorine gas	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%
Hydrogen sulfide	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%

**\*Note:** Applications involving hydrogen gas sensing require the use of a sensor identified by the letter "H" in the catalog order guide. Current hydrogen stable catalog listings are: AWM2100VH, AWM2300VH, and AWM42150VH. Other listings may be established as hydrogen stable devices. Please contact the Application Center for assistance at 1-800-537-6945.