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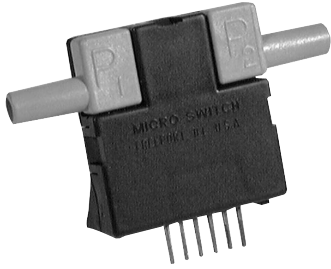
**Sensing and Control**  
Honeywell Inc.  
11 West Spring Street  
Freeport, Illinois 61032



# Airflow Sensors

## Microbridge Mass Airflow/Unamplified

AWM 2000 Series



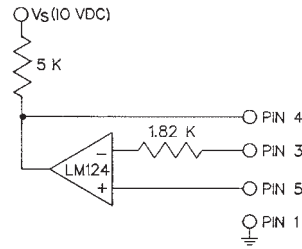
### FEATURES

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

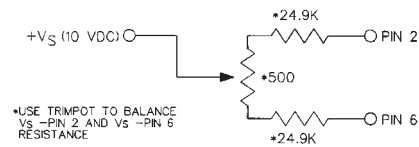
The AWM2000 Series microbridge mass airflow sensor is a passive device comprised of two Wheatstone bridges. The heater control circuit in Figure 1 is required for operation per specifications. The sensing bridge supply circuit in Figure 2 is also required for operation per specifications. These two circuits 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.

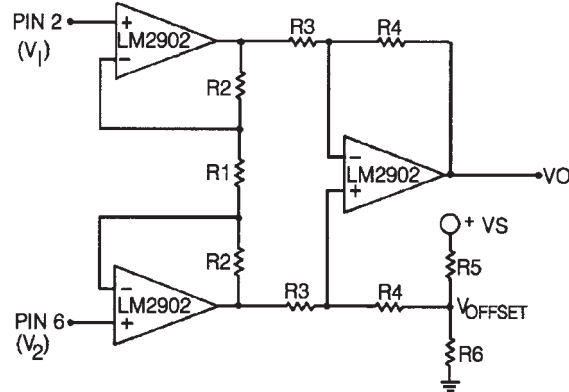
**Figure 1**  
**Heater Control Circuit**



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



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



**Equation 1:**

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

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

Airflow Sensors
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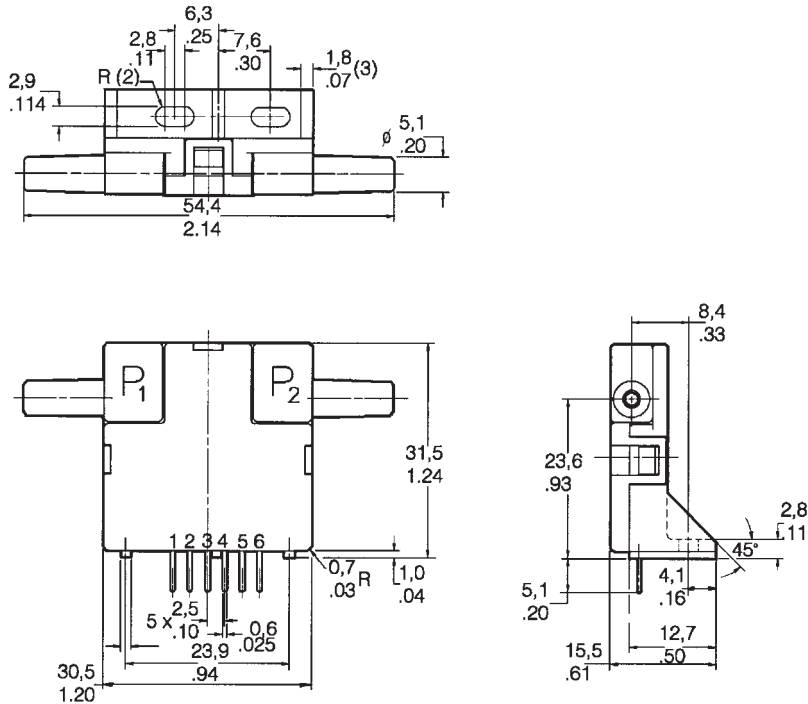
AWM2000 Series

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<br>(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.<br>+25° to -25°C, +25° to 85°C      | ±0.20 mV                                                                           | ±0.20 mV                   | ±0.20 mV                              | ±0.20 mV                   |
| Output Voltage Shift, Max.<br>+25° to -25°C<br>+25° to +85°C | +2.5% Reading<br>-2.5% Reading                                                     | +5% Reading<br>-5% Reading | +22% Reading (Note 2)<br>-22% Reading | +5% Reading<br>-5% Reading |
| Repeatability & Hysteresis, Max.                             | ±0.35% Reading                                                                     | ±0.35% Reading             | ±0.35% Reading                        | ±1% Reading                |
|                                                              | Min.                                                                               | Typ.                       | Max.                                  |                            |
| 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)<br>Pin 2-Pin 1, Pin 6-Pin 1           | —                                                                                  | 5                          | —                                     |                            |
| Sensor Current (mA)<br>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:
- 1. Output Voltage is ratiometric to supply voltage.
  - 2. Temperature shifts when sensing differential pressure correlates to the density change of the gas over temperature. See Application Note 1.
  - 3. 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

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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

