

## Microbridge Mass Airflow/Unamplified and Amplified



### FEATURES

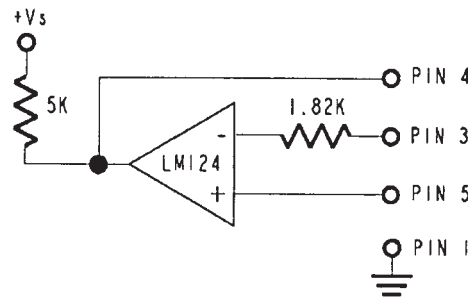
- Manifold mount/o-ring sealed
- Ceramic flow-tube (non-outgassing), 0-1000 sccm
- Plastic flow tube, 0-6 SLPM
- High common mode pressure (150 psi ceramic flow-tube only)
- Operating temperature up to 125°C (unamplified only)
- High stability at null and full-scale

The AWM40000 Series mass flow sensor family is based on proven microbridge technology and includes both amplified signal conditioned devices and unamplified sensor only devices.

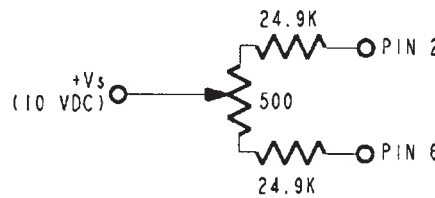
When using the unamplified devices (AWM42150VH and AWM42300V), the heater control circuit in Figure 1 and the sensing bridge supply circuit in Figure 2 are both required for operation per specification. These two circuits are **NOT** on board the sensor and must be supplied in the application. The differential amplifier circuitry in Figure 3 may be useful in providing output gain and/or introducing voltage offsets to the sensor output (Ref. Equation 1).

The amplified devices (AWM43300V and AWM43600V) can be used to increase output gain and introduce voltage offsets. The differential instrumentation amplifier circuitry, heater control circuitry and sensing bridge supply circuitry are all provided onboard the amplified sensors.

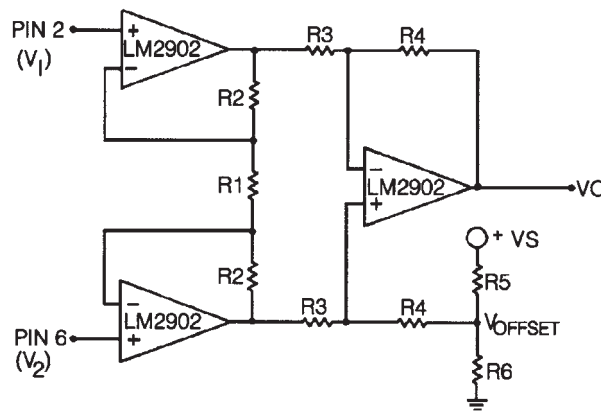
**Figure 1**  
**Heater Control Circuit**



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



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



**Equation 1:**

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

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

# Airflow Sensors

## Microbridge Mass Airflow/Unamplified and Amplified

AWM40000 Series

### AWM40000 SERIES ORDER GUIDE (Performance Characteristics @ 10.01 ±0.01 VDC, 25°C)

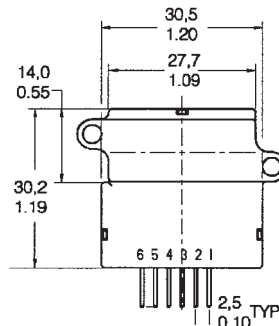
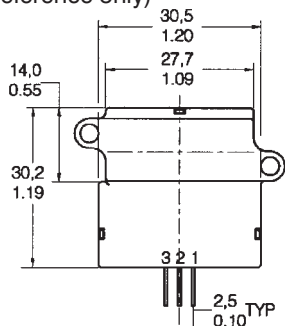
| Catalog Listings                                  | AWM42150VH                                                                             | AWM42300V                                | AWM43300V                                                                            | AWM43600V                                |
|---------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------|
| Flow Range (Full Scale)                           | ±25 sccm                                                                               | ±1000 sccm                               | +1000 sccm                                                                           | +6 SLPM                                  |
| Output Voltage @ Trim Point                       | 8.5 mV ±1.5 mV @ 25 sccm                                                               | 54.7 mV ±3.7 mV DC @ 1000 sccm           | 5 V ±0.15 VDC @ 1000 sccm                                                            | 5 V ±0.15 VDC @ 6 SLPM                   |
| Null Voltage                                      | 0.0 ±1.0 mVDC                                                                          | 0.0 ±1.5 mVDC                            | 1.0 ±0.05 VDC                                                                        | 1.0 ±0.05 VDC                            |
| Null Voltage Shift +25° to -25°C, +25° to +85°C   | ±0.20 mVDC                                                                             | ±0.20 mVDC                               | ±0.025 VDC                                                                           | ±0.025 VDC                               |
| Output Voltage Shift +25° to -25°C, +25° to +85°C | +2.5% Reading typ.<br>-2.5% Reading typ.                                               | +2.5% Reading max.<br>-2.5% Reading max. | -5.0% Reading max.<br>+6.0% Reading max.                                             | -6.0% Reading max.<br>+6.0% Reading max. |
| Power Consumption (mW)                            | 60 (Max.)                                                                              | 60 (Max.)                                | 60 (Max.)                                                                            | 75 (Max.)                                |
| Repeatability & Hysteresis                        | ±0.35% Reading (3)                                                                     | ±0.50% Reading                           | ±0.50% Reading                                                                       | ±1.00% Reading                           |
| Pressure Drop @ Full Scale (in H <sub>2</sub> O)  | 0.008" H <sub>2</sub> O (Typ.)                                                         | 1.02 (Typ.)                              | 1.02 (Typ.)                                                                          | 8.00 (Typ.)                              |
|                                                   | <b>Min.</b>                                                                            | <b>Typ.</b>                              | <b>Max.</b>                                                                          |                                          |
| Excitation VDC                                    | 8.0                                                                                    | 10±0.01                                  | 15                                                                                   |                                          |
| Response Time (msec)                              | —                                                                                      | 1.0                                      | 3.0 (Note 1)                                                                         |                                          |
| Common Mode Pressure (psi) (max.)                 | —                                                                                      | —                                        | 150 psi (10 Bar)                                                                     | 25 psi (1.7 Bar)                         |
| Output Load                                       | NPN (Sinking): 10 mA<br>PNP (Sourcing): 20 mA                                          |                                          |                                                                                      |                                          |
| Temperature Range                                 | Operating: -40° to +125°C (-40° to +251°F)<br>Storage: -40° to +125°C (-40° to +251°F) |                                          | Operating: -25° to +85°C (-13° to +185°F)<br>Storage: -40° to +90°C (-40° to +194°F) |                                          |
| Calibration Gas                                   | Nitrogen                                                                               |                                          |                                                                                      |                                          |
| Ratiometricity Error                              | ±0.30% Reading                                                                         |                                          |                                                                                      |                                          |
| Weight (grams)                                    | 14 g                                                                                   |                                          |                                                                                      | 11 g                                     |
| Shock Rating                                      | 100 g peak (5 drops, 6 axes)                                                           |                                          |                                                                                      |                                          |
| Termination                                       | 2,54 mm (.100") centers, 0,635 cm (0.025") square                                      |                                          |                                                                                      |                                          |

#### Notes:

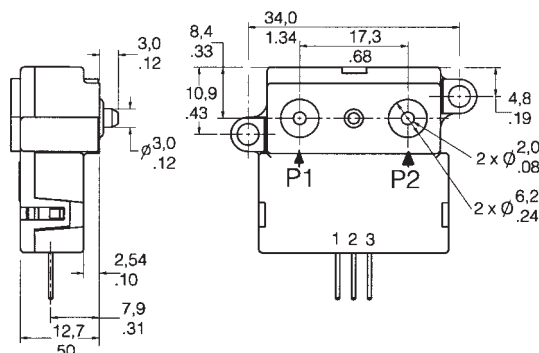
1. Response time is typically 1 msec from 10 to 90%.
2. Repeatability & Hysteresis tolerances reflect inherent inaccuracies of the measurement equipment.
3. Maximum allowable rate of flow change to prevent damage: 5.0 SLPM/1.0 sec.

#### MOUNTING DIMENSIONS (for reference only)

Amplified Sensors



Unamplified Sensors



**Note:** Positive flow direction is defined as proceeding from Port 1 (P1) to Port 2 (P2), and results in positive output.

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### OUTPUT FLOW VS INTERCHANGEABILITY (Note 1)

Performance Characteristics @ 10.0 ± 0.01 VDC, 25°C

| AWM42150VH       |           |         |               | AWM42300V   |              |         |               | AWM43300V   |             |          |                | AWM43600V   |           |          |                |
|------------------|-----------|---------|---------------|-------------|--------------|---------|---------------|-------------|-------------|----------|----------------|-------------|-----------|----------|----------------|
| Press. $\mu$ Bar | Flow sccm | Nom. mV | Tol. $\pm$ mV | Press. mBar | Flow sccm    | Nom. mV | Tol. $\pm$ mV | Press. mBar | Flow sccm   | Nom. VDC | Tol. $\pm$ VDC | Press. mBar | Flow SLPM | Nom. VDC | Tol. $\pm$ VDC |
| 20               | <b>30</b> | 9.9     | 1.5           | 2.23        | <b>1000</b>  | 54.7    | 2.00          | 2.23        | <b>1000</b> | 5.00     | 0.15           | 20.0        | <b>6</b>  | 5.00     | 0.15           |
| 17               | <b>25</b> | 8.5     | 1.5           | 1.52        | <b>800</b>   | 53.0    | 2.0           | 1.87        | <b>900</b>  | 4.97     | 0.16           | 14.7        | <b>5</b>  | 4.89     | 0.20           |
| 14               | <b>20</b> | 6.8     | 1.5           | 0.94        | <b>600</b>   | 49.3    | 2.5           | 1.52        | <b>800</b>  | 4.89     | 0.17           | 9.07        | <b>4</b>  | 4.70     | 0.25           |
| 10               | <b>15</b> | 5.2     | 1.0           | 0.49        | <b>400</b>   | 42.5    | 3.5           | 1.16        | <b>700</b>  | 4.78     | 0.18           | 6.40        | <b>3</b>  | 4.40     | 0.35           |
| 7                | <b>10</b> | 3.5     | 1.0           | 0.19        | <b>200</b>   | 29.8    | 4.0           | 0.94        | <b>600</b>  | 4.63     | 0.19           | 3.35        | <b>2</b>  | 3.80     | 0.30           |
| 3                | <b>5</b>  | 1.7     | 1.0           | 0.00        | <b>0</b>     | 0.0     | 1.5           | 0.71        | <b>500</b>  | 4.43     | 0.20           | 1.17        | <b>1</b>  | 3.10     | 0.30           |
| 0                | <b>0</b>  | 0.0     | 1.0           | -0.19       | <b>-200</b>  | -29.8   | 4.0           | 0.50        | <b>400</b>  | 4.15     | 0.21           | 0.00        | <b>0</b>  | 1.00     | 0.05           |
|                  |           |         |               | -0.49       | <b>-400</b>  | -42.5   | 5.0           | 0.33        | <b>300</b>  | 3.76     | 0.19           |             |           |          |                |
|                  |           |         |               | -0.94       | <b>-600</b>  | -49.3   | 6.0           | 0.19        | <b>200</b>  | 3.23     | 0.17           |             |           |          |                |
|                  |           |         |               | -1.52       | <b>-800</b>  | -53.0   | 6.0           | 0.08        | <b>100</b>  | 2.49     | 0.14           |             |           |          |                |
|                  |           |         |               | -2.23       | <b>-1000</b> | -55.2   | 6.0           | 0.00        | <b>0</b>    | 1.00     | 0.05           |             |           |          |                |

### Notes:

- Numbers in **BOLD** type indicate calibration type, mass flow or differential pressure.  
Tolerance values apply to calibration type only.

