**WARNING**

**PERSONAL INJURY**

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury. Failure to comply with these instructions could result in death or serious injury.

**GENERAL INFORMATION**

The AWM2000 Series Microbridge Mass Airflow Sensor is a passive device consisting of two Wheatstone bridges: one for closed loop heater control and one for the twin sensing elements. The heater control in Figure 1 is required for operation per specification. The sensing bridge supply circuit in Figure 2 is also required. The differential instrumentation amplifier in Figure 3 can be used to increase gain and introduce voltage offsets to sensor output.

**MEDIA CONTAMINATION**

Dust has the effect of clogging the porous metal flow restrictor (AWM2200V only). Dust accumulation causes the pressure drop across the sensor to increase for any given flow rate.

Clogging can be prevented by use of an inexpensive 5 micron filter upstream of the sensing element.

**Figure 1. Heater Control Circuit**

\[ +V_S \text{ (10 Vdc)} \]

\[ 5k \]

\[ 1.82k \]

\[ \text{PIN 4} \]

\[ \text{PIN 3} \]

\[ \text{PIN 5} \]

\[ \text{PIN 1} \]

**Figure 2. Sensing Bridge Supply Circuit**

\[ +V_S \text{ (10 Vdc)} \]

\[ *24.9k \]

\[ *500 \]

\[ \text{PIN 2} \]

\[ \text{PIN 6} \]

* Use trimpot to balance \( V_S \) - PIN 2 and \( V_S \) - PIN 6 resistance

**Figure 3. Differential Instrumentation Amplifier**

**OUTPUT VOLTAGE vs. FLOW**

- **AWM 2100 V**
  - **AWM 2200 V**
  - **AWM 2300 V**

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**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Type</th>
<th>AWM2100V</th>
<th>AWM2150V</th>
<th>AWM2200V</th>
<th>AWM2300V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended excitation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(using test circuit)</td>
<td>10 ± 0.01 Vdc</td>
<td>10 ± 0.01 Vdc</td>
<td>10 ± 0.01 Vdc</td>
<td>10 ± 0.01 Vdc</td>
</tr>
<tr>
<td>Power consumption</td>
<td>30 mW</td>
<td>30 mW</td>
<td>30 mW</td>
<td>30 mW</td>
</tr>
<tr>
<td>Output voltage trim point</td>
<td>30 mV @ 100 sccm</td>
<td>2.5 mV @ 5 sccm</td>
<td>20 mV @ 2 in H₂O</td>
<td>50 mV @ 650 sccm</td>
</tr>
<tr>
<td>Null voltage</td>
<td>0.00 ± 1.0 mV</td>
<td>0.00 ± 1.0 mV</td>
<td>0.00 ± 1.0 mV</td>
<td>0.00 ± 1.0 mV</td>
</tr>
<tr>
<td>Null voltage shift @ -25 to +85°C</td>
<td>± 0.14 mV</td>
<td>± 0.14 mV</td>
<td>± 0.05 mV</td>
<td>± 0.14 mV</td>
</tr>
<tr>
<td>Output voltage shift</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+25 to -25°C</td>
<td>+2.5% Reading</td>
<td>-5% Reading</td>
<td>+22% Reading</td>
<td>+5% Reading</td>
</tr>
<tr>
<td>+25 to +85°C</td>
<td>-2.5% Reading</td>
<td>-5% Reading</td>
<td>-22% Reading</td>
<td>-5% Reading</td>
</tr>
<tr>
<td>Repeatability and hysteresis max.</td>
<td>± 0.35% reading</td>
<td>± 1.0% reading</td>
<td>± 0.35% reading</td>
<td>± 1.0% reading</td>
</tr>
<tr>
<td>Response time, max.</td>
<td>3.0 ms</td>
<td>3.0 ms</td>
<td>3.0 ms</td>
<td>3.0 ms (1)</td>
</tr>
<tr>
<td>Temperature range</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>-25 °C to 85 °C</td>
<td>-25 °C to 85 °C</td>
<td>-25 °C to 85 °C</td>
<td>-25 °C to 85 °C</td>
</tr>
<tr>
<td>Storage</td>
<td>-40 °C to 90 °C</td>
<td>-40 °C to 90 °C</td>
<td>-40 °C to 90 °C</td>
<td>-40 °C to 90 °C</td>
</tr>
<tr>
<td>Termination 2.54 mm centers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.100 in centers)</td>
<td>0.64 mm (0.025 in) square</td>
<td>0.64 mm (0.025 in) square</td>
<td>0.64 mm (0.025 in) square</td>
<td>0.64 mm (0.025 in) square</td>
</tr>
<tr>
<td>Weight</td>
<td>10.8 gram</td>
<td>10.8 gram</td>
<td>10.8 gram</td>
<td>10.8 gram</td>
</tr>
<tr>
<td>Shock rating (5 drops, ea. of 6 axes)</td>
<td>100 g peak</td>
<td>100 g peak</td>
<td>100 g peak</td>
<td>100 g peak</td>
</tr>
<tr>
<td>Overpressure, max.</td>
<td>25 psi</td>
<td>25 psi</td>
<td>25 psi</td>
<td>25 psi (5)</td>
</tr>
<tr>
<td>Sensor resistance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Pin 2 - Pin 1, Pin 6 - Pin 1)</td>
<td>5 kOhm typ.</td>
<td>5 kOhm typ.</td>
<td>5 kOhm typ.</td>
<td>5 kOhm typ.</td>
</tr>
<tr>
<td>Sensor current</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Pin 2 - Pin 1, Pin 6 - Pin 1)</td>
<td>0.3 mA</td>
<td>0.3 mA</td>
<td>0.3 mA</td>
<td>0.3 mA</td>
</tr>
</tbody>
</table>

1. Response time typically 1 ms from 10%-90%.
2. Output voltage is ratiometric to supply voltage.
3. Repeatability and hysteresis tolerances reflect inherent inaccuracies of the measurement equipment.
4. Temperature shifts in differential pressure devices are mostly due to the density change of the gas over temperature.
5. Temperature shifts in massflow devices are due to the change of the second order TCR coefficient over temperature.
6. Maximum flow rate to prevent damage to sensing element (includes flow pulse) is 5 LPM.

**OUTPUT FLOW Vs. INTERCHANGEABILITY**

<table>
<thead>
<tr>
<th>Flow sccm</th>
<th>Nom. mV</th>
<th>Tol.* ± mV</th>
<th>Flow sccm</th>
<th>Nom. mV</th>
<th>Tol.* ± mV</th>
<th>Pres. in H₂O</th>
<th>Nom. mV</th>
<th>Tol.* ± mV</th>
<th>Flow sccm</th>
<th>Nom. mV</th>
<th>Tol.* ± mV</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>44.50</td>
<td>4.25</td>
<td>20</td>
<td>9.55</td>
<td>3.0</td>
<td>4.00</td>
<td>31.75</td>
<td>3.50</td>
<td>1000</td>
<td>55.50</td>
<td>3.70</td>
</tr>
<tr>
<td>150</td>
<td>38.75</td>
<td>3.00</td>
<td>15</td>
<td>7.35</td>
<td>2.0</td>
<td>3.00</td>
<td>26.75</td>
<td>2.50</td>
<td>800</td>
<td>52.90</td>
<td>3.50</td>
</tr>
<tr>
<td>100</td>
<td>30.00</td>
<td>1.50</td>
<td>10</td>
<td>4.90</td>
<td>1.5</td>
<td>2.00</td>
<td>20.00</td>
<td>1.20</td>
<td>650</td>
<td>50.00</td>
<td>2.50</td>
</tr>
<tr>
<td>50</td>
<td>16.50</td>
<td>2.50</td>
<td>5</td>
<td>2.50</td>
<td>0.6</td>
<td>1.00</td>
<td>11.20</td>
<td>1.80</td>
<td>400</td>
<td>40.50</td>
<td>3.00</td>
</tr>
<tr>
<td>0</td>
<td>0.00</td>
<td>1.00</td>
<td>3</td>
<td>1.50</td>
<td>0.9</td>
<td>0.00</td>
<td>1.00</td>
<td></td>
<td>200</td>
<td>29.20</td>
<td>3.20</td>
</tr>
<tr>
<td>-50</td>
<td>-16.50</td>
<td>4.50</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>-1.00</td>
<td>-11.20</td>
<td>3.00</td>
<td>0</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>-100</td>
<td>-30.00</td>
<td>5.00</td>
<td>-3</td>
<td>-1.50</td>
<td>1.2</td>
<td>-2.00</td>
<td>-20.00</td>
<td>3.30</td>
<td>-200</td>
<td>-28.90</td>
<td>15.00</td>
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<tr>
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<td>-38.75</td>
<td>7.65</td>
<td>-5</td>
<td>-2.50</td>
<td>1.2</td>
<td>-3.00</td>
<td>-26.75</td>
<td>5.30</td>
<td>-400</td>
<td>-41.20</td>
<td>26.00</td>
</tr>
<tr>
<td>-200</td>
<td>-44.50</td>
<td>9.75</td>
<td>-10</td>
<td>-4.90</td>
<td>3.0</td>
<td>-4.00</td>
<td>-31.75</td>
<td>7.00</td>
<td>-600</td>
<td>-48.20</td>
<td>29.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-15</td>
<td>-7.35</td>
<td>4.0</td>
<td></td>
<td></td>
<td></td>
<td>-800</td>
<td>-52.50</td>
<td>32.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-20</td>
<td>-9.55</td>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td>-1000</td>
<td>-55.00</td>
<td>36.00</td>
</tr>
</tbody>
</table>

*The unique design of the microbridge mass airflow sensor accommodates your special application requirements. Custom laser trimming and flow channel dimensioning can conform performance characteristics to specific applications. Contact your HONEYWELL sales office, see page 4.*
NOTE: Positive flow direction is defined as proceeding into Port 1 (P1) and out of Port 2 (P2), resulting in positive output (Pin 6 > Pin 2). Negative flow direction is defined conversely and results in negative output (Pin 6 < Pin 2).

ORDER GUIDE

<table>
<thead>
<tr>
<th>Catalog Listing</th>
<th>Description</th>
<th>Flow Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWM2100V</td>
<td>±200 sccm / ±0.2 in H₂O full scale</td>
<td></td>
</tr>
<tr>
<td>AWM2150V</td>
<td>±20 sccm / ±0.02 in H₂O full scale</td>
<td></td>
</tr>
<tr>
<td>AWM2200V</td>
<td>±60 sccm (±20 sccm) / ±2 in H₂O full scale</td>
<td></td>
</tr>
<tr>
<td>AWM2300V</td>
<td>±1000 sccm / ±1.36 in (±0.1 in) H₂O full scale</td>
<td></td>
</tr>
</tbody>
</table>

MASSFLOW vs. DIFFERENTIAL PRESSURE

The microbridge chip is fundamentally a mass flow sensor chip using a thermal transfer mechanism. The more mass flowing past the chip, the more heat being transferred. The sensing range can be expanded when sensing a sampled flow of the main flow by decreasing the ratio of the main flow path’s diameter to the minimum diameter of the airflow tube within the sensor. Choking off the sampled flow results in reverse amplification, achieved by mechanical means. It is then possible to measure differential pressure proportional to mass flow. The greater the differential pressure, the more mass that flows. Variations in density of flowing media due to ambient pressure and temperature changes will change AWM2200V differential pressure sensor output in proportion to the change in absolute density. The other mass flow sensors are not affected by density changes.
**MOUNTING INSTRUCTIONS**

**CAUTION**

**PRODUCT DAMAGE**

Do not expose ports to forces greater than 5 pounds in a direction perpendicular to port centerline. Forces greater than 5 pounds may damage sensor housing.

Failure to comply with these instructions may result in product damage.

1. Use a maximum torque of 2 in./lbs. when tightening mounting screws or other fasteners.
2. Grasp housing between thumb and forefinger to connect tubing to sensor ports. Note: In this position, the port designation will be covered. The port is supported when the sensor is held in this position.
3. Ease tubing onto port. Thin-walled 1/4" Tygon or equivalent tubing is recommended.

**SOLDERING INSTRUCTIONS**

**Note:** sensor should be securely attached to PC board before soldering

**Hand soldering:**
1. Use temperature controlled soldering iron with 3.2 mm (1/8 in) diameter tip.
2. Set temperature at 400 °C [750 °F]. Hold tip on terminal for 5 seconds maximum.
3. Use Type R flux rosin core solder and hand clean after soldering.

**CLEANING**

**CAUTION**

**CLEANING DAMAGE**

- Do not use ultrasonics when cleaning. This may damage the microstructure.
- Cover ends of tube during cleaning. Certain solvents may attack the epoxy sealing chip tube to ceramic substrate.
- Do not use: methylene chloride, methyl pyrrolidone, III trichlorethane, or any oxidizing type acid such as formic acid.

Failure to comply with these instructions may result in product damage.

Avoid cleaning the sensor if at all possible. If necessary, clean the sensor with water or isopropyl alcohol only and dry the device thoroughly.

**WARRANTY/REMEDY**

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer’s sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

1-800-537-6945 USA
1-800-737-3360 Canada
1-815-235-6847 International

FAX
1-815-235-6545 USA

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