

Installation Instructions for the AWM40000 Series Mass Gas-Flow Sensors

ISSUE 5
PK80005

GENERAL INFORMATION

AWM40000 Series microbridge mass gas-flow sensors operate on the theory of heat transfer due to mass gas-flow across the surface of the sensing element. The sensing element consists of a resistor bridge heater circuit and dual temperature-sensing resistor bridges. This configuration senses mass flow rates and flow direction. Amplified or unamplified sensor outputs are available. The **unamplified** sensors require additional customer supplied circuitry (Figures 1 and 2). The Figure 3 circuit and Equation 1 may be used to increase gain and introduce voltage offsets to the sensor output. **Amplified** sensors contain all necessary circuitry for heater control, sensing bridge supply, and amplifier functions.

MASS FLOW VS. DIFFERENTIAL PRESSURE SENSING

As flow passes through the sensor, the internal flow restriction creates a pressure drop. The greater the differential pressure, the greater the flow passing through the sensor. When measuring differential pressure, the output varies proportionately to the absolute density change of the media gas. Variations in gas density due to barometric pressure or temperature changes will affect sensor output.

DESCRIPTION

| Catalog Listing | Flow Range |
|-----------------|-------------------------------------|
| AWM42150VH | ±25 sccm/±0.008 in H ₂ O |
| AWM42300V | ±1000 sccm/±1.0 in H ₂ O |
| AWM43300V | +1000 sccm/+1.0 in H ₂ O |
| AWM43600V | +6 SLPM/+8.0 in H ₂ O |

NOTICE

Media flow through the sensor should be free of condensing moisture and particulates. Large, high-velocity particles or conductive particles may damage the sensing element. Use of an inexpensive 5 micron filter, upstream of the sensing element, is recommended.

Figure 1: Heater Control Circuit

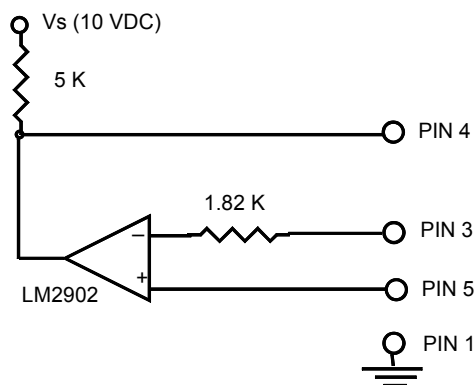


Figure 2: Sensing Bridge Supply Circuit

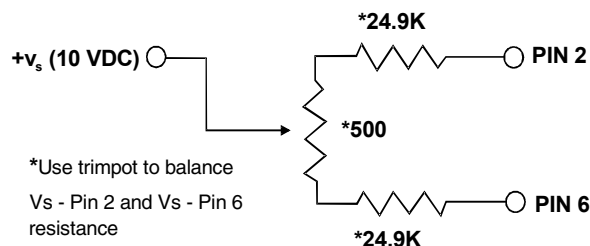
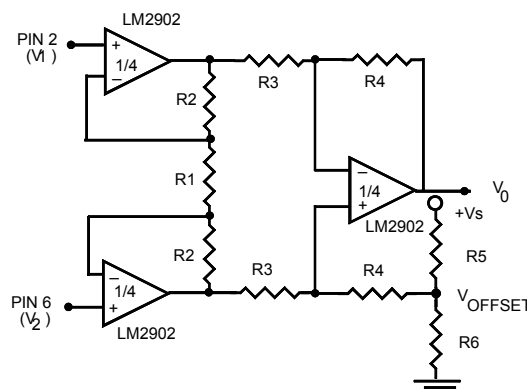


Figure 3: Differential Instrumentation Amplifier (Optional)



Equation 1

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

where

$$V_{\text{offset}} = V_S \frac{R_6}{R_6 + R_5}$$

SPECIFICATIONS

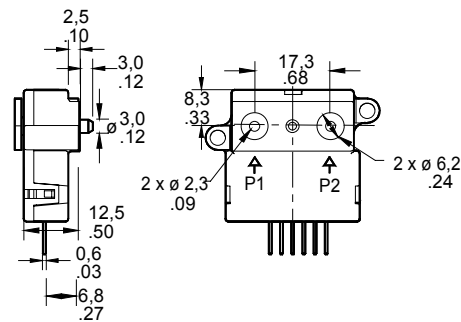
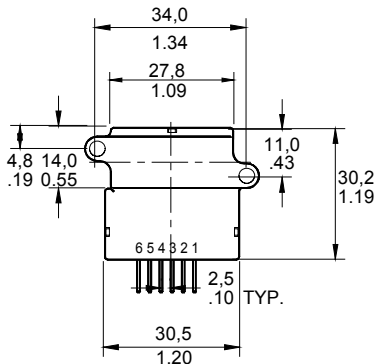
| Catalog Listing | AWM42150VH | | | AWM42300V | | | AWM43300V | | | AWM43600V | | |
|---|--|---------|------|---|---------|------|---|---------|------|---|---------|--------|
| Flow Range (Full scale) | ±25 sccm | | | ±1000 sccm | | | +1000 sccm | | | +6 SLPM | | |
| Output Voltage (mV) @ Trim Point | 8.5 mV ±1.5 mVdc @ 25 sccm | | | 55.2 mV ±2.0 mVdc @ 1000 sccm | | | 5.0 V ±0.15.0 Vdc @ 1000 sccm | | | 5.0 V ±0.15.0 Vdc @ 6 SLPM | | |
| Null Voltage | 0.0 mV ±1.0 mVdc | | | 0.0 mV ±1.0 mVdc | | | 1.0 V ±0.05 Vdc | | | 1.0 ±0.05 Vdc | | |
| Null Voltage Shift: 25 °C to -25 °C, 25 °C to 85 °C | ±0.2 mVdc (typ.) | | | ±0.2 mVdc (typ.) | | | ±0.025 Vdc (max.) | | | ±0.050 Vdc (max.) | | |
| Output Voltage Shift 25 °C to -25 °C 25 °C to 85 °C | 2.5 % Reading (typ.) -2.5 % Reading (typ.) | | | 2.5 % Reading (max.) -2.5 % Reading (max.) | | | -5 % Reading (max.) 6 % Reading (max.) | | | -7 % Reading (max.) 7 % Reading (max.) | | |
| Power Consumption (mW) | 40 mW (max) @ 85 °C | | | 50 mW (max) @ 85 °C | | | 60 mW (max) @ 85 °C | | | 75 mW (max) @ 85 °C | | |
| Repeatability & Hysteresis (3) | ±0.35 % Reading | | | ±0.35 % Reading | | | ±0.50 % Reading | | | ±1.00 % Reading | | |
| Pressure Drop @ Full Scale (in of H ₂ O) | 0.008 (typ.) | | | 1.02 (typ.) | | | 1.02 (typ) | | | 8.00 (typ) | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. |
| Excitation Vdc (2) | 8.0 | 10±0.01 | 15 | 8.0 | 10±0.01 | 15 | 8.0 | 10±0.01 | 15 | 9.99 | 10±0.01 | 15 (5) |
| Max. Common Mode Pressure (psi) (4) | 250 (max.) | | | 250 (max.) | | | 250 (max.) | | | 25 (max.) | | |
| Ratiometricity Error | ±0.35 % Reading, typ. (2) | | | | | | | | | ± 0.8 % Reading, typ. (2) | | |
| Temperature Range | Operating: -40 °C to 125 °C [-40 °F to 257 °F] Storage: -40 °C to 125 °C [-40 °F to 257 °F] | | | | | | Operating: -25 °C to 85 °C [-13 °F to 185 °F] Storage: -40 °C to 125 °C [-40 °F to 257 °F] | | | | | |
| Response Time (ms) | 1 ms (typ.), 3 ms (max.) (1) | | | | | | | | | | | |
| Output Load | sinking: 10 mA; sourcing: 20 mA | | | | | | | | | | | |
| Calibration gas | Nitrogen | | | | | | | | | | | |
| Weight (grams) | 17.5 g (typ.) [0.62 oz] includes 43 g for backing plate | | | | | | | | | | | |
| Shock Rating | 100 g peak (5 drops, 6 axes) | | | | | | | | | | | |
| Termination | 2.5 mm [0.100 in] centers, 0.635 mm [0.025 in] square | | | | | | | | | | | |

Notes:

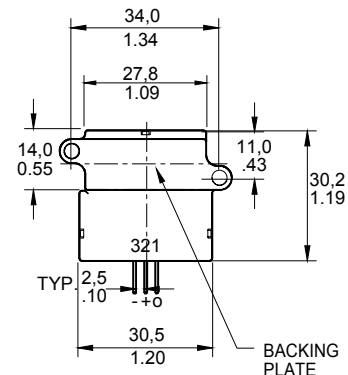
1. Response time is typically 1 ms from 10 % to 90 %.
2. Output voltage is ratiometric to supply voltage.
3. Repeatability and hysteresis tolerances reflect inherent inaccuracies of the measurement equipment.
4. Maximum rate of flow change to prevent damage: 5 SLPM/s.
5. 11.0 Vdc minimum excitation required for operation within specification above 50 °C.

MOUNTING DIMENSIONS (for reference only) mm/in

Unamplified Sensors



Amplified Sensors

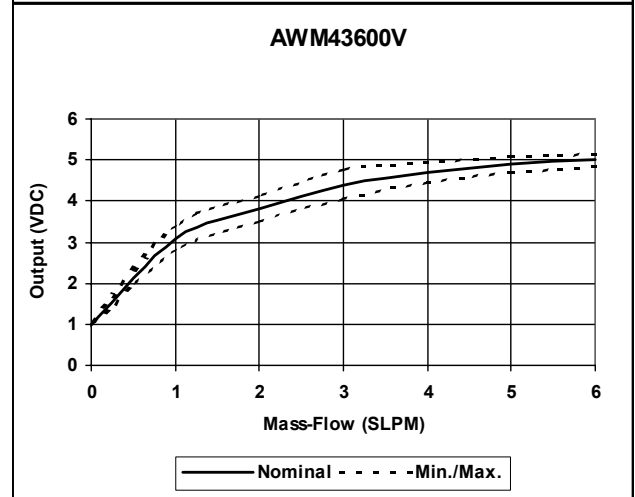
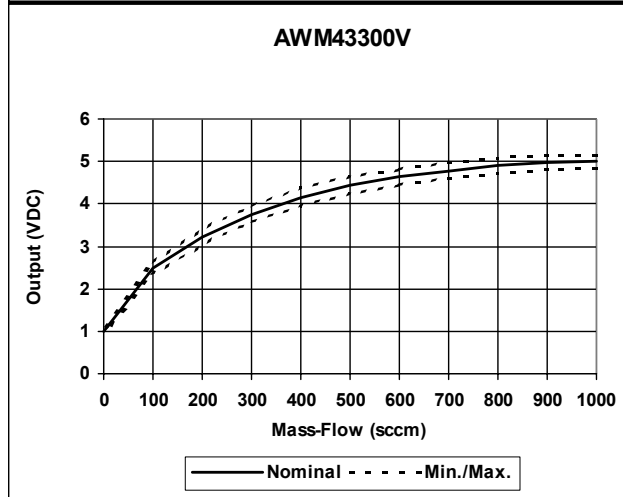
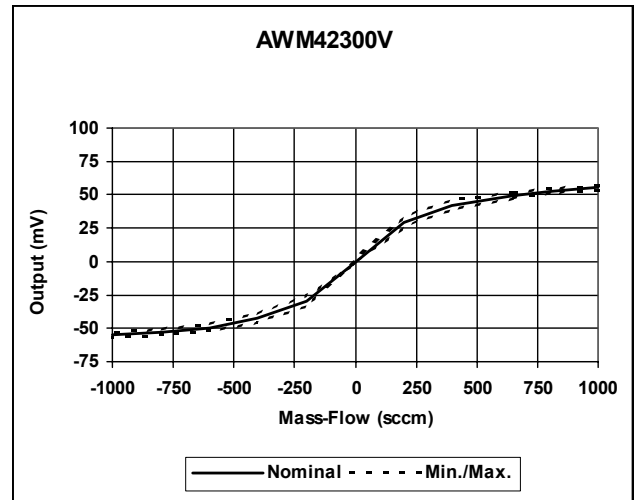
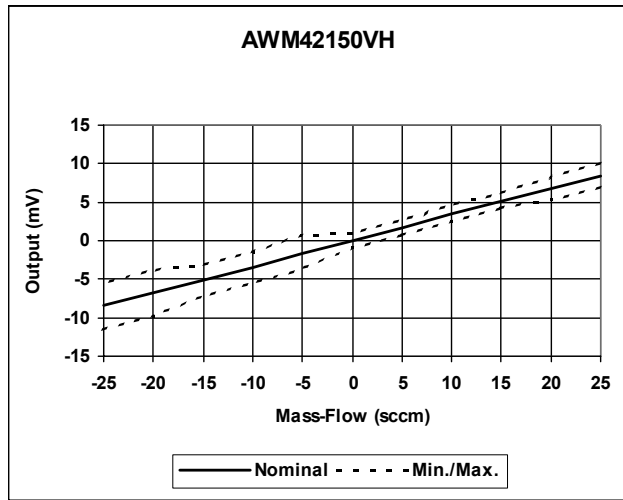


Note: Positive flow direction is defined as proceeding into Port 1 (P1) and out of Port 2 (P2), resulting in positive output (Pin 6 > Pin 2). Negative flow direction is defined conversely and results in negative output (Pin 6 < Pin 2).

OUTPUT FLOW VS INTERCHANGEABILITY

| AWM42150VH | | | AWM42300V | | | AWM43300V | | | AWM43600V | | |
|------------|----------|----------------|-----------|----------|----------------|-----------|---------|---------------|-----------|---------|---------------|
| Flow sccm | Nom mVdc | TOL \pm mVdc | Flow sccm | Nom mVdc | TOL \pm mVdc | Flow sccm | Nom Vdc | TOL \pm Vdc | Flow SLPM | Nom Vdc | TOL \pm Vdc |
| 25 | 8.50 | 1.5 | 1000 | 55.2 | 2.0 | 1000 | 5.00 | 0.15 | 6 | 5.00 | 0.15 |
| 20 | 6.80 | 1.5 | 800 | 53.0 | 2.0 | 900 | 4.97 | 0.16 | 5 | 4.89 | 0.20 |
| 15 | 5.20 | 1.0 | 600 | 49.3 | 2.5 | 800 | 4.89 | 0.17 | 4 | 4.70 | 0.25 |
| 10 | 3.50 | 1.0 | 400 | 42.5 | 3.5 | 700 | 4.78 | 0.18 | 3 | 4.40 | 0.35 |
| 5 | 1.70 | 1.0 | 200 | 29.8 | 4.0 | 600 | 4.63 | 0.19 | 2 | 3.80 | 0.30 |
| 0 | 0.00 | 1.0 | 0 | 0.0 | 1.5 | 500 | 4.43 | 0.20 | 1 | 3.10 | 0.30 |
| | | | -200 | -29.8 | 4.0 | 400 | 4.15 | 0.21 | 0 | 1.00 | 0.05 |
| | | | -400 | -42.5 | 5.0 | 300 | 3.76 | 0.19 | | | |
| | | | -600 | -49.3 | 6.0 | 200 | 3.23 | 0.17 | | | |
| | | | -800 | -53.0 | 6.0 | 100 | 2.49 | 0.14 | | | |
| | | | -1000 | -55.2 | 6.0 | 0 | 1.00 | 0.05 | | | |

OUTPUT CURVES



MOUNTING

NOTICE

1. Recommended mounting torque: 0.3 Nm to 0.7 Nm [3.0 in lb to 6.0 in lb].
2. Backing-plate (included) is required for use with common mode pressures in excess of 25 psi.
3. To achieve optimum sealing, insert one O-ring (2 Viton® 75 Durometer included) into each sensor flow port (**P1** and **P2**). O-ring industry standard 2-006 (recommended Durometer 60 to 75).
4. Mount as follows to help prevent misalignment and improper sealing.
 - a. Insert both mounting screws and lightly tighten.
 - b. Apply recommended mounting torque to both mounting screws.

CLEANING

NOTICE

Do not use ultrasonic cleaning. This may damage the microstructure. Cover flow ports P1 and P2 during any cleaning operation. Certain solvents may attack the epoxy used to attach the microstructure to the ceramic substrate.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, 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. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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.

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.

Automation and Control Solutions

Sensing and Control

Honeywell

11 West Spring Street

Freeport, Illinois 61032

www.honeywell.com/sensing

SOLDERING

NOTICE

Securely attach sensor to PC board before soldering.

Hand Soldering: Use temperature controlled soldering iron with 3,2 mm [1/8 in] diameter tip. Set temperature at 400 °C [750 °F]. Hold tip on terminal for five seconds maximum. Use type "R" flux rosin core solder.

Wave Solder: Set solder temperature at 250 °C [480 °F] maximum. Minimum drive speed should be 1,54 m [5 ft] per minute.

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.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

Phone and Fax:

Asia Pacific +65 6355-2828

+65 6445-3033 Fax

Europe +44 (0) 1698 481481

+44 (0) 1698 481676 Fax

Latin America +1-305-805-8188

+1-305-883-8257 Fax

USA/Canada +1-800-537-6945

+1-815-235-6847

+1-815-235-6545 Fax

Honeywell