

### FEATURES

- Ranges 0...±200 sccm<sup>1</sup>  
or 0...±2 "H<sub>2</sub>O (0...±5 mbar)
- Bidirectional sensing
- Actual mass flow sensing
- Low differential pressure sensing

### SERVICE

To be used with dry gases only

The AWM series is NOT designed for liquid flow and will be damaged by liquid flow through the sensor



### SPECIFICATIONS

#### Maximum ratings

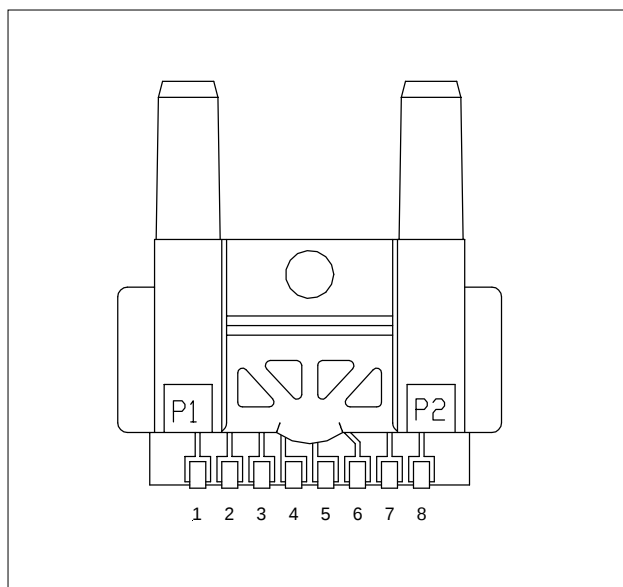
|                             |                              |
|-----------------------------|------------------------------|
| Supply voltage <sup>2</sup> | 8 to 15 V<br>typ. 10 ±0.01 V |
| Power consumption           | 50 mW                        |
| Temperature limits          |                              |
| Operating                   | -25 to 85°C                  |
| Storage                     | -40 to 90°C                  |
| Mechanical shock            | 100 g (5 drops, 6 axes)      |

Note:

<sup>1</sup> sccm denotes standard cubic centimeters per minute

<sup>2</sup> Output voltage is ratiometric to supply voltage

### ELECTRICAL CONNECTION



# AWM90000 Series

## Mass flow sensor for gases

**Honeywell**

### FLOW SENSOR CHARACTERISTICS<sup>3</sup>

$V_s = 10 \pm 0.01 \text{ V}$ ,  $T_A = 25^\circ\text{C}$

| Part no.  | Flow range (full scale) | Pressure range       | Max. flow change <sup>4</sup> | Output voltage @ trim point |
|-----------|-------------------------|----------------------|-------------------------------|-----------------------------|
| AWM92100V | ±200 sccm               |                      | 5.0 l/sec                     | 77 mV @ 200 sccm            |
| AWM92200V |                         | ±2 "H <sub>2</sub> O | 5.0 l/sec                     | 38 mV @ 2 "H <sub>2</sub> O |

### PERFORMANCE CHARACTERISTICS

$V_s = 10 \pm 0.01 \text{ V}$ ,  $T_A = 25^\circ\text{C}$

| Characteristics                         |                                                  |                           |           | Min. | Typ.              | Max.  | Unit      |
|-----------------------------------------|--------------------------------------------------|---------------------------|-----------|------|-------------------|-------|-----------|
| Zero offset                             |                                                  |                           |           | -15  | 0                 | 15    | mV        |
| Repeatability and hysteresis (combined) |                                                  | AWM92100V                 |           |      |                   | ±0.35 | %FSO      |
|                                         |                                                  | AWM92200V                 |           |      | ±0.1              |       | % reading |
| Ratiometricity error <sup>2</sup>       |                                                  |                           |           |      | ±0.30             |       |           |
| Temperature effects <sup>5</sup>        | Offset                                           | -25 to 85 °C <sup>6</sup> |           |      | ±2.0 <sup>7</sup> |       | mV        |
|                                         | Span                                             | -25 to 25 °C              | AWM92100V |      | -3.0 <sup>8</sup> |       | %FSO      |
|                                         |                                                  |                           | AWM92200V |      | 25 <sup>5</sup>   |       | % reading |
|                                         |                                                  | 25 to 85 °C               | AWM92100V |      | ±1.0 <sup>8</sup> |       | %FSO      |
|                                         |                                                  |                           | AWM92200V |      | -30 <sup>5</sup>  |       | % reading |
|                                         | Sensor resistance (pin 1 - pin 2, pin 1 - pin 8) |                           |           |      | 1.5               | 1.75  | 2.2       |
| Sensor current                          |                                                  |                           |           |      |                   | 0.6   | mA        |
| Response time                           |                                                  |                           |           |      | 1.0               | 3.0   | ms        |
| Common mode pressure                    |                                                  |                           |           |      |                   | 25    | psi       |

Notes:

<sup>2</sup> Output voltage is ratiometric to supply voltage

<sup>3</sup> A 5 micron filter is recommended for all devices.

<sup>4</sup> Maximum allowable rate of flow change to prevent damage.

<sup>5</sup> Temperature shifts in differential pressure devices are mostly due to the density change of the gas over temperature.

<sup>6</sup> Shift is relative to 25 °C.

<sup>7</sup> Assumes low TCR bridge resistance used (pins 2 and 8).

<sup>8</sup> Requires recommended Rc value of 1K Ohm is used (pins 3 to 7) and typ. heater control circuit. Maximum current Rh.

### OUTPUT FLOW VS INTERCHANGEABILITY

$V_s = 10 \pm 0.01 \text{ V}$ ,  $T_A = 25^\circ\text{C}$

#### AWM92100V FLOW SPECIFICATIONS

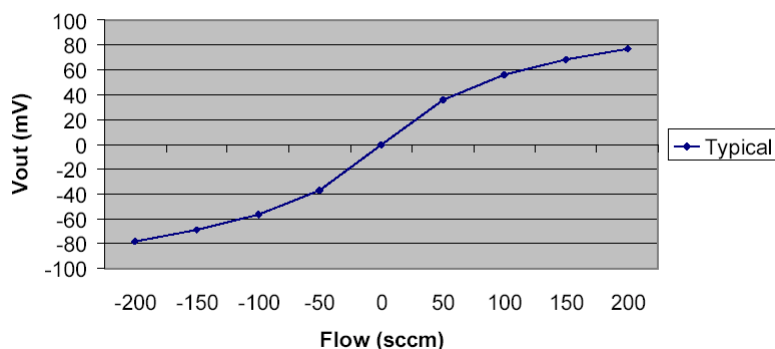
| Flow (sccm) | Nominal (mV Typical) | $\pm$ Tolerance (mV Typical) |
|-------------|----------------------|------------------------------|
| 200         | 77                   | 32                           |
| 150         | 68                   | 29                           |
| 100         | 56                   | 25                           |
| 50          | 36                   | 17                           |
| 0           | 0                    | 20                           |
| -50         | -37                  | 18                           |
| -100        | -57                  | 26                           |
| -150        | -69                  | 30                           |
| -200        | -78                  | 33                           |

#### AWM92200V FLOW SPECIFICATIONS

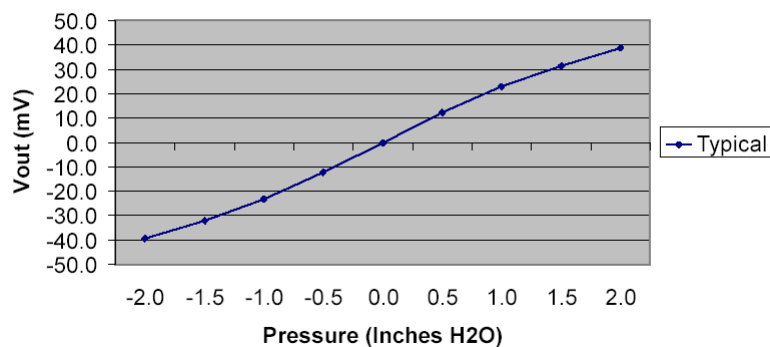
| Pressure (inch H <sub>2</sub> O) | Nominal (mV) Typical | Typical Min. (mV) | Typical Max. (mV) |
|----------------------------------|----------------------|-------------------|-------------------|
| 2.0                              | 38                   | 22                | 77                |
| 1.5                              | 32                   | 18                | 66                |
| 1.0                              | 23                   | 12                | 49                |
| .5                               | 12                   | 7                 | 29                |
| 0                                | 0                    | -20               | 20                |
| -.5                              | -12                  | -7                | -30               |
| -1.0                             | -23                  | -12               | -51               |
| -1.5                             | -32                  | -18               | -68               |
| -2.0                             | -39                  | -22               | -79               |

### OUTPUT CURVES

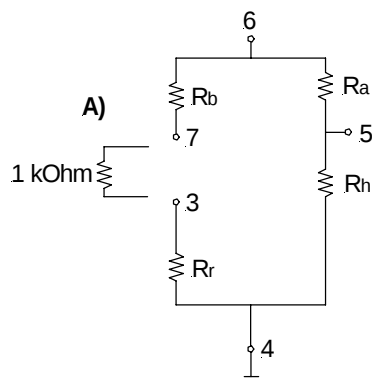
AWM92100V Output vs. Flow



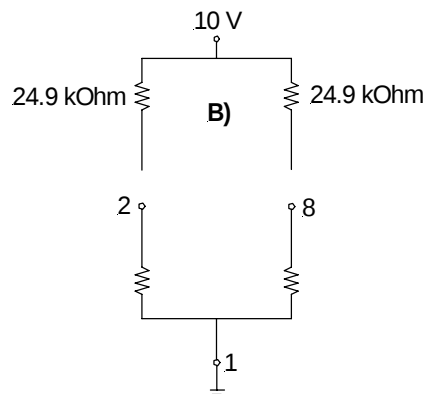
AWM92200V Output vs. Pressure



## HEATER CONTROL CIRCUIT



## SENSING BRIDGE SUPPLY CIRCUIT



### Note:

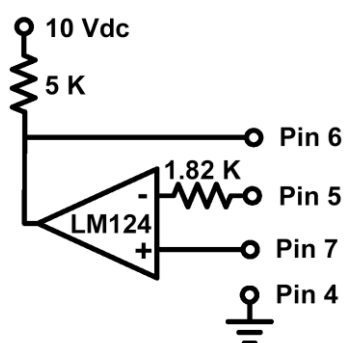
**Circuits required for operation per specifications. Circuits are not on board the sensor.**

A) Customer supplied 1 kOhm resistor (affects temperature compensation and span voltage).

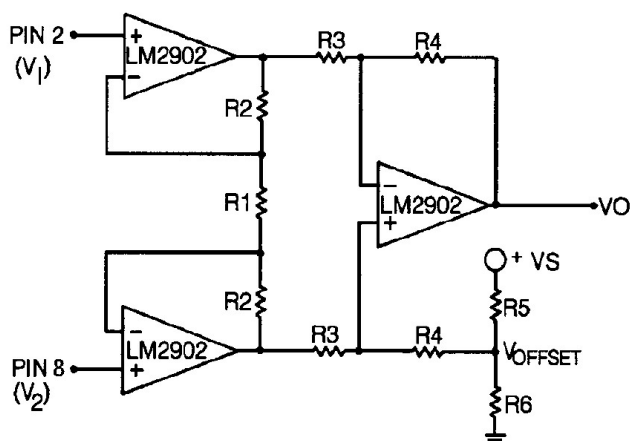
B) Customer supplied 24.9 kOhm matched bridge resistors (affects null output voltage).

Output is measured differentially from pins 8 to 2.

## HEATER CONTROL CIRCUIT (suggested)



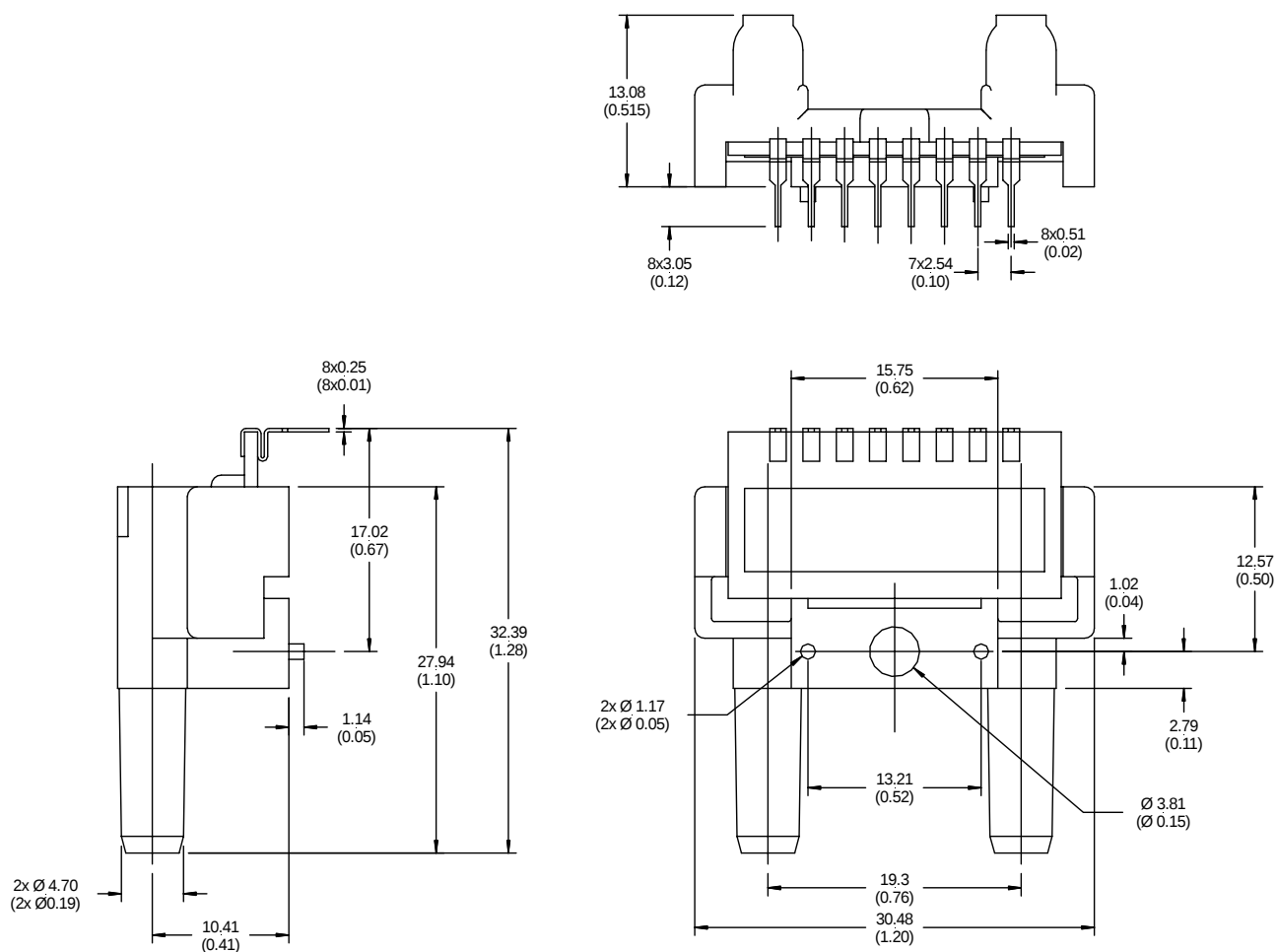
## DIFFERENTIAL INSTRUMENTATION AMPLIFIER CIRCUIT (OPTIONAL)



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

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

### OUTLINE DRAWING



mass: approx. 5.6 g

dimensions in mm (inches)

**GAS CORRECTION FACTORS<sup>9</sup>**

| Gas type                            | Correction factor (approx.) |
|-------------------------------------|-----------------------------|
| Helium (He)                         | 0.5 <sup>10</sup>           |
| Hydrogen (H <sub>2</sub> )          | 0.7 <sup>10,11</sup>        |
| Argon (Ar)                          | 0.95                        |
| Nitrogen (N <sub>2</sub> )          | 1.0                         |
| Oxygen (O <sub>2</sub> )            | 1.0                         |
| Air                                 | 1.0                         |
| Nitric oxide (NO)                   | 1.0                         |
| Carbon monoxide (CO)                | 1.0                         |
| Methane (CH <sub>4</sub> )          | 1.1                         |
| Ammonia (NH <sub>3</sub> )          | 1.1                         |
| Nitrous oxide (N <sub>2</sub> O)    | 1.35                        |
| Nitrogen dioxide (NO <sub>2</sub> ) | 1.35                        |
| Carbon dioxide (CO <sub>2</sub> )   | 1.35                        |

Notes:

<sup>9</sup> Gas correction factors are referenced to nitrogen (N<sub>2</sub>) as calibration gas type. Approximate gas correction factors are provided as guidelines only. Individual gas types may perform differently at temperature extremes and varying flow rates.

<sup>10</sup> When sensing Hydrogen (H<sub>2</sub>) or Helium (He) it may be necessary to power the mass flow sensor using increased supply voltage: Hydrogen typ. 12 V, Helium typ. 15 V

<sup>11</sup> Hydrogen (H<sub>2</sub>) flow measurement requires the use of a special sensor. These devices provide normal operation when sensing hydrogen flow and are designated with an "H" at the end of the order number.

**ORDERING INFORMATION**

| Flow range | Dry gas   |
|------------|-----------|
| ±200 sccm  | AWM92100V |

| Pressure range                 | Dry gas   |
|--------------------------------|-----------|
| ±2 "H <sub>2</sub> O (±5 mbar) | AWM92200V |

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