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### **Sensing and Control**

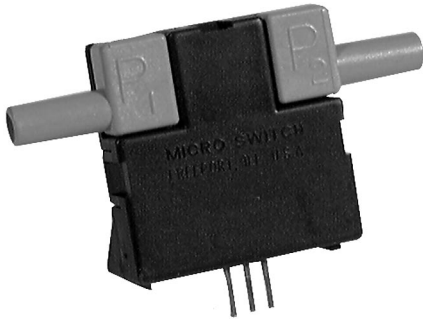
Honeywell Inc.

11 West Spring Street

Freeport, Illinois 61032

# Airflow Sensors

## Microbridge Mass Airflow/Amplified

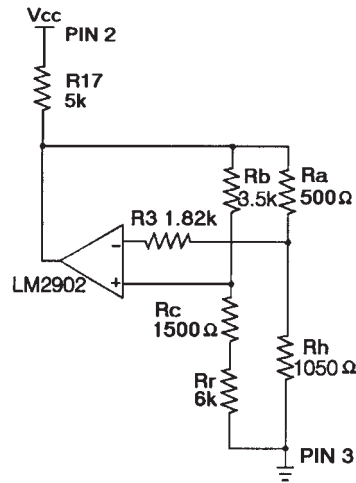


### FEATURES

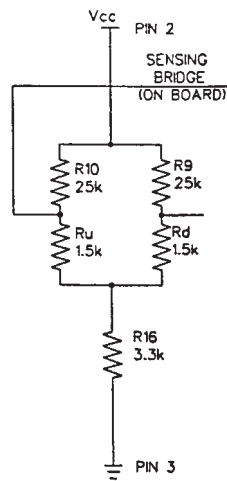
- Laser trimmed for improved sensor interchangeability
- Flow sensing up to 1.0 SLPM
- Low differential pressure sensing

Like the AWM2000 Series, the dual Wheatstone bridges control airflow measurement. The AWM3000 Series is amplified; therefore, it can be used to increase the gain and to introduce voltage offsets to the sensor output. The schematic in Figure 3 depicts the amplification circuitry on board the sensor. Also, the heater control circuit (see Figure 1) and the sensing bridge supply circuit (see Figure 2) are on board the package.

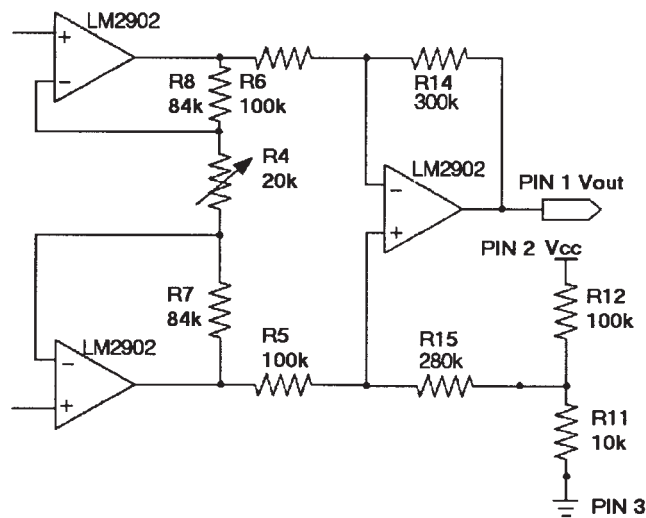
**Figure 1**  
Heater control circuit



**Figure 2**  
Sensing bridge supply circuit



**Figure 3**  
Differential instrumentation amplifier circuit



# Airflow Sensors

## Microbridge Mass Airflow/Amplified

AWM3000 Series

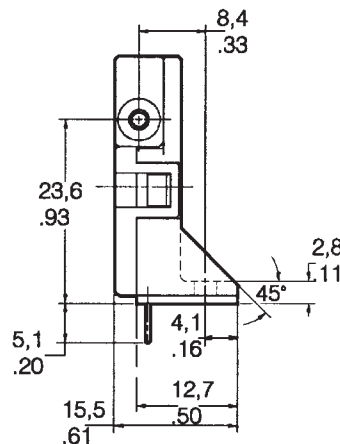
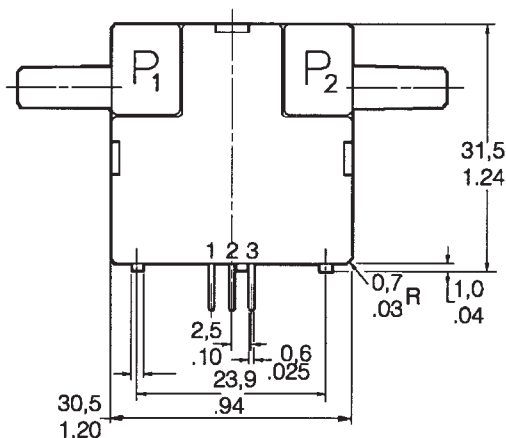
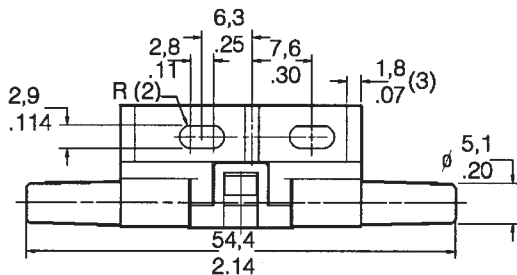
### AWM3000 SERIES ORDER GUIDE (Performance Characteristics @ 10.01 ±0.01 VDC, 25°C)

Catalog Listings	AWM3100V	AWM3150V	AWM3200V	AWM3300V
Flow Range (Full Scale)	+200 sccm	+30 sccm		+1000 sccm
Pressure Range (See Application Note 1)			+2.0" H <sub>2</sub> O (5 mBar)	
Output Voltage @ Trim Point	5 VDC @ 200 sccm	3.4 VDC @ 25 sccm	5 VDC @ 2" H <sub>2</sub> O	5 VDC @ 1000 sccm
Null Voltage	1.00 ±0.05 VDC	1.00 ±0.10 VDC	1.00 ±0.08 VDC	1.00 ±0.10 VDC
Null Voltage Shift, Typ. +25° to -25°C, 25° to +85°C	±25 mV	±100 mV	±25 mV	±25 mV
Output Voltage Shift, Max. +25° to -25°C +25° to +85°C	-4% Reading +4% Reading	±5% Reading ±5% Reading	+24% Reading (Note 3) -24% Reading	-5% Reading +5% Reading
Repeatability & Hysteresis, Max.	±0.50% Reading	±1% Reading	±0.50% Reading	±1% Reading
	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	
Excitation VDC (Note 2)	8.0	10±0.01	15	
Power Consumption (mW)	—	50	60	
Response Time (msec) (Note 1)	—	1.0	3.0	
Common Mode Pressure (psi)	—	—	25	
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. Initial warm-up time for signal conditioned circuitry is 1 minute max.
2. Output Voltage is ratiometric to supply voltage.
3. Temperature shifts when sensing differential pressure correlates to the density change of the gas over temperature. (See Application Note 1.)
4. Maximum allowable rate of flow change to prevent damage: 5 SLPM/1 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. Do not exert a force greater than 4.54kg (10 lbs.) in any direction.

# Airflow Sensors

## Microbridge Mass Airflow/Amplified

AWM3000 Series

### OUTPUT FLOW VS INTERCHANGEABILITY (Note 1)

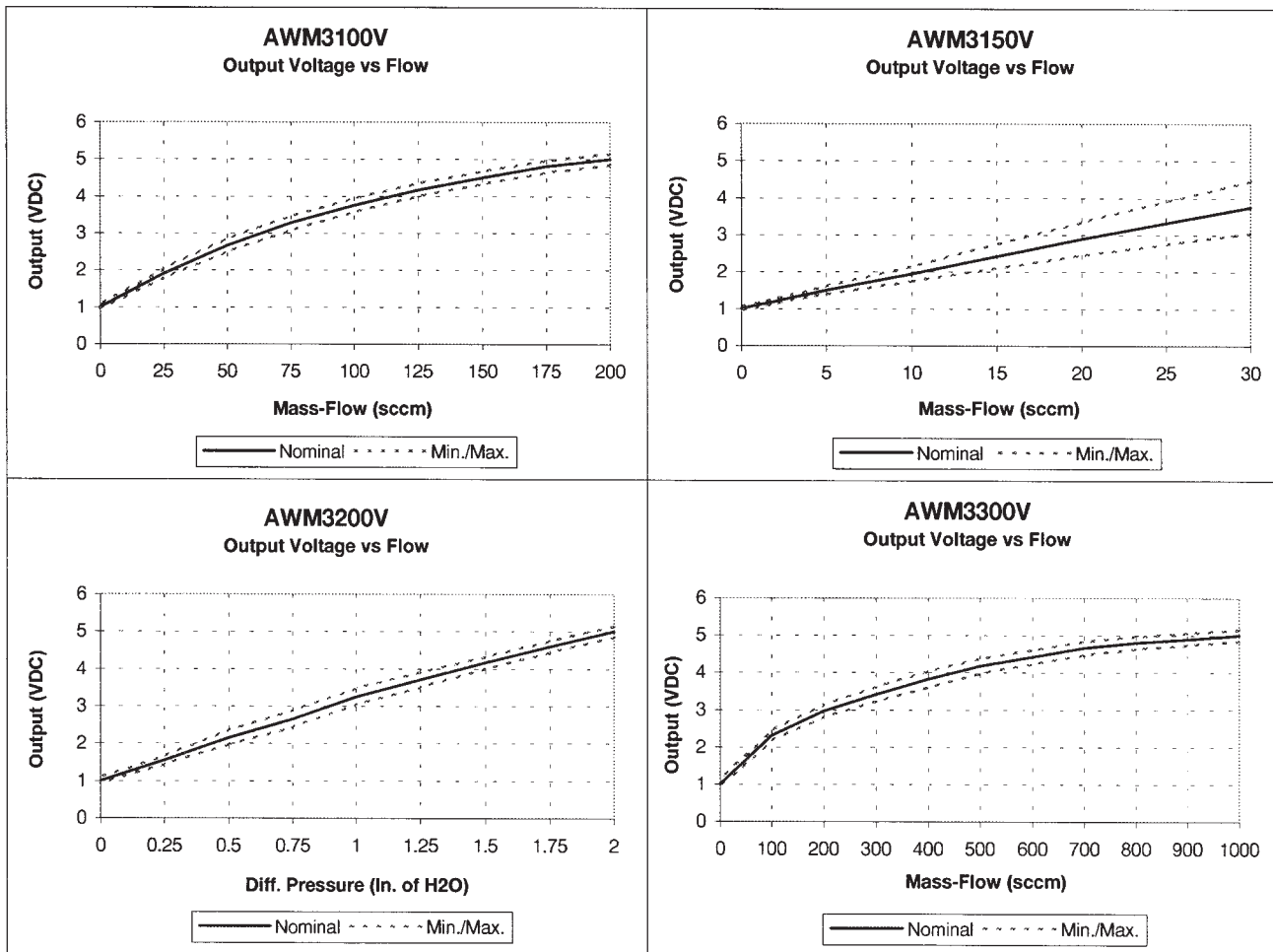
Performance Characteristics @ 10.0 ±0.01 VDC, 25 C

AWM3100V				AWM3150V				AWM3200V (Note 2)				AWM3300V			
Press. mBar	Flow sccm	Nom. VDC	Tol. ± VDC	Press. mBar	Flow sccm	Nom. VDC	Tol. ± VDC	Flow sccm	Press. " H <sub>2</sub> O	Nom. VDC	Tol. ± VDC	Press. mBar	Flow sccm	Nom. VDC	Tol. ± VDC
0.49	<b>200</b>	5.00	0.15	2.50	<b>30</b>	3.75	0.70	60.0	<b>2.00</b>	5.00	0.15	3.40	<b>1000</b>	5.00	0.15
0.42	<b>175</b>	4.80	0.16	1.70	<b>20</b>	2.90	0.45	53.0	<b>1.75</b>	4.59	0.15	2.90	<b>900</b>	4.90	0.16
0.35	<b>150</b>	4.50	0.17	0.84	<b>10</b>	1.95	0.20	46.0	<b>1.50</b>	4.16	0.16	2.40	<b>800</b>	4.80	0.17
0.28	<b>125</b>	4.17	0.18	0.42	<b>5</b>	1.50	0.10	38.0	<b>1.25</b>	3.70	0.20	2.00	<b>700</b>	4.66	0.18
0.21	<b>100</b>	3.75	0.19	0.34	<b>4</b>	1.40	0.08	30.0	<b>1.00</b>	3.25	0.22	1.60	<b>600</b>	4.42	0.19
0.14	<b>75</b>	3.27	0.19	0.26	<b>3</b>	1.30	0.08	23.0	<b>0.75</b>	2.65	0.22	1.20	<b>500</b>	4.18	0.20
0.09	<b>50</b>	2.67	0.17	0.17	<b>2</b>	1.20	0.07	16.0	<b>0.50</b>	2.15	0.19	0.80	<b>400</b>	3.82	0.21
0.04	<b>20</b>	1.90	0.13	0.08	<b>1</b>	1.10	0.06	8.0	<b>0.25</b>	1.55	0.11	0.54	<b>300</b>	3.41	0.19
0.00	<b>0</b>	1.00	0.05	0.00	<b>0</b>	1.00	0.05	0.0	<b>0.00</b>	1.00	0.08	0.31	<b>200</b>	2.96	0.17
												0.12	<b>100</b>	2.30	0.14
												0.00	<b>0</b>	1.00	0.10

### 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



Airflow

# Airflow Sensors

## Microbridge Mass Airflow/Amplified

AWM3000 Series

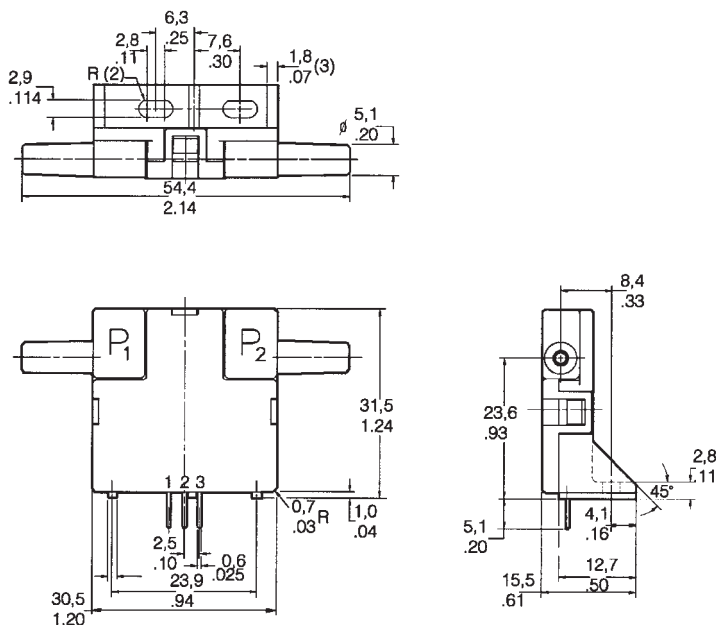
### AWM3000 SERIES ORDER GUIDE (Performance Characteristics @ 10.01 ±0.01 VDC, 25°C)

Catalog Listings	AWM3200CR*	AWM3201CR*	AWM3303V
Flow Range (Full Scale)			±1000 sccm (1 SLPM)
Differential Pressure Range	0 - 2" H <sub>2</sub> O (5 mBar)	0 - 0.5" H <sub>2</sub> O (1.25 mBar)	
Output Type	4 - 20 mA DC (linear)	4 - 20 mA DC (linear)	1 - 5 VDC (Note 2)
Output @ Trim Point	20.0 ±1 mA DC @ 2" H <sub>2</sub> O	20.0 ±1 mA DC @ .05" H <sub>2</sub> O	5.00 ±0.150 VDC
Null Output	4.00 ±0.3 mA DC	4.00 ±0.4 mA DC	3.00 ±0.050 VDC
Null Shift +25° to -25°C, +25° to +85°C	±2 mA DC (max.)	±2 mA DC (max.)	±.050 VDC (max.)
Output Shift +25° to -25°C +25° to +85°C	+24% Reading -31% Reading (Note 3)	+32% Reading -32% Reading (Note 3)	-5% Reading +5% Reading
Linearity Error	±5% Reading	±5% Reading	N/A
External Output Load	100 - 300 Ω (Note 4)	100 - 300 Ω (Note 4)	N/A
Response Time (Note 1)	60 msec (max.)	60 msec (max.)	3 msec (max.)
Repeatability & Hysteresis, Max.	±0.50% Reading	±0.50% Reading	±1% Reading
Excitation VDC	10 ±0.01	10±0.01	8-15
Power Consumption (mW)	—	50	100
Common Mode Pressure (psi)	—	—	25
Calibration Gas	Nitrogen		
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. Initial warm-up time for signal conditioned circuitry is 1 minute max.
  2. Output Voltage is ratiometric to supply voltage.
  3. Temperature shifts when sensing differential pressure correlates to the density change of the gas over temperature.
  4. Output load connected from V<sub>OUT</sub> to GND (current sinking).
  5. Maximum allowable rate of flow change to prevent damage: 5.0 SLPM/1.0 sec.
- \* A 5 micron filter must be used on differential pressure sensors.

#### 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. Do not exert a force greater than 4.54kg (10 lbs.) in any direction.

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## Microbridge Mass Airflow/Amplified

AWM3000 Series

### OUTPUT FLOW VS INTERCHANGEABILITY (Note 1)

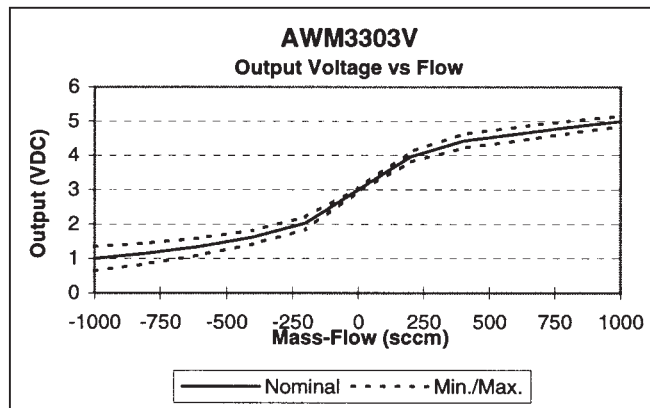
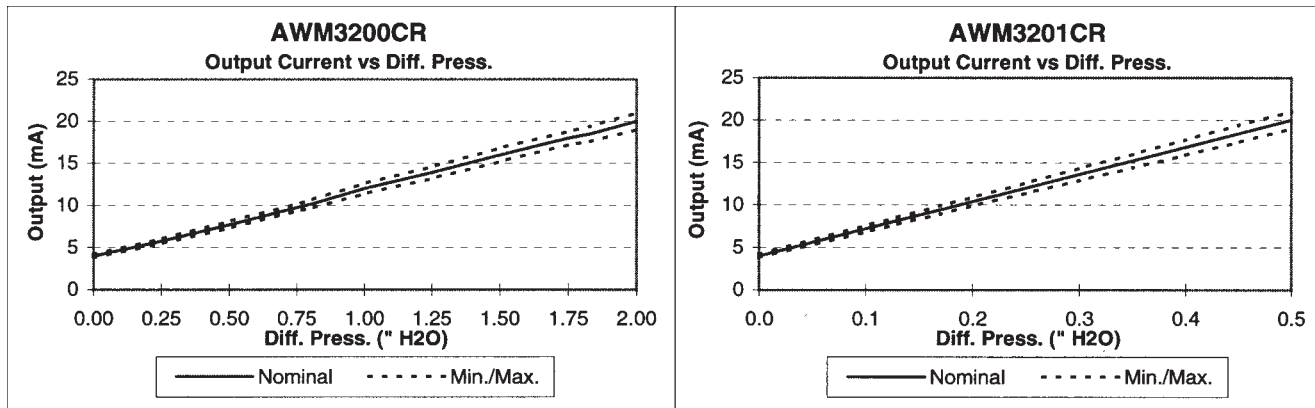
Performance Characteristics @ 10.0 ± 0.01 VDC, 25 C

AWM3200CR (Note 2)				AWM3201CR (Note 2)				AWM3303V			
Flow sccm	Press. " H <sub>2</sub> O	Nom. mA DC	Tol. ± mA DC	Flow sccm	Press. " H <sub>2</sub> O	Nom. mA DC	Tol. ± mA DC	Press mBar	Flow sccm	Nom. VDC	Tol. ± VDC
0	<b>0.00</b>	4.00	0.3	0	<b>0.00</b>	4.0	0.4	3.49	<b>1000</b>	5.00	0.15
7	<b>0.25</b>	5.75	0.3	35	<b>0.10</b>	7.2	0.4	2.42	<b>800</b>	4.82	0.18
15	<b>0.50</b>	7.70	0.4	42	<b>0.13</b>	8.0	0.4	1.59	<b>650</b>	4.67	0.20
22	<b>0.75</b>	9.75	0.4	53	<b>0.17</b>	9.4	0.5	0.83	<b>400</b>	4.42	0.20
25	<b>0.81</b>	10.21	0.5	61	<b>0.20</b>	10.4	0.5	0.31	<b>200</b>	3.96	0.15
30	<b>1.00</b>	12.00	0.6	71	<b>0.25</b>	12.0	0.6	0.00	<b>0</b>	3.00	0.05
37	<b>1.25</b>	13.90	0.7	81	<b>0.30</b>	13.6	0.7	-0.31	<b>-200</b>	2.03	0.18
45	<b>1.50</b>	16.00	0.8	87	<b>0.35</b>	15.2	0.8	-0.83	<b>-400</b>	1.62	0.20
52	<b>1.75</b>	18.00	0.8	97	<b>0.40</b>	16.8	0.9	-1.59	<b>-600</b>	1.35	0.25
55	<b>1.83</b>	18.50	0.9	105	<b>0.45</b>	18.4	1.0	-2.42	<b>-800</b>	1.15	0.30
60	<b>2.00</b>	20.00	1.0	113	<b>0.50</b>	20.0	1.0	-3.44	<b>-1000</b>	1.00	0.35

#### 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



Airflow