

## Installation Instructions for the AWM2000 Series

ISSUE 3  
PK 88544

### ⚠️ 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

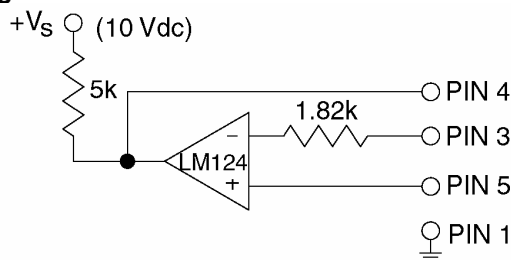
The AWM2000 Series Microbridge Mass Airflow Sensor is a passive device consisting of two Wheatstone bridges: one for closed loop heater control and one for the twin sensing elements. The heater control in Figure 1 is required for operation per specification. The sensing bridge supply circuit in Figure 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

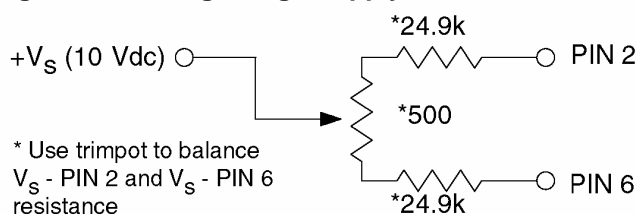
Dust has the effect of clogging the porous metal flow restrictor (AWM2200V only). Dust accumulation causes the pressure drop across the sensor to increase for any given flow rate.

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

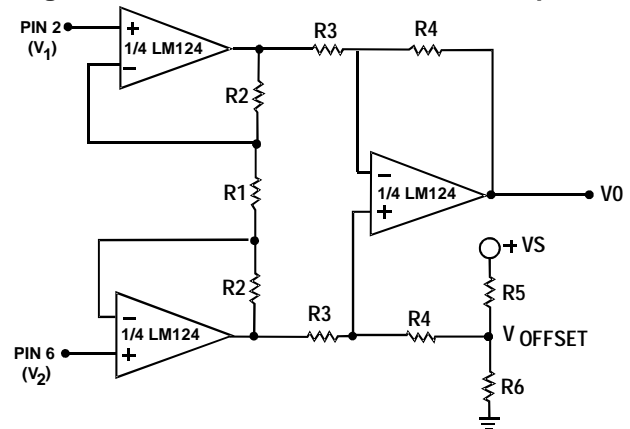
**Figure 1. Heater Control Circuit**



**Figure 2. Sensing Bridge Supply Circuit**

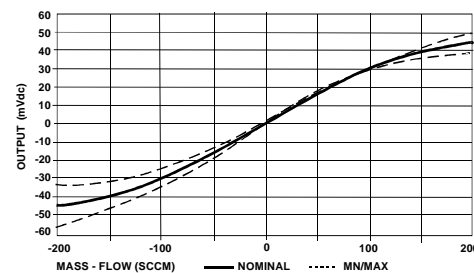


**Figure 3. Differential Instrumentation Amplifier**

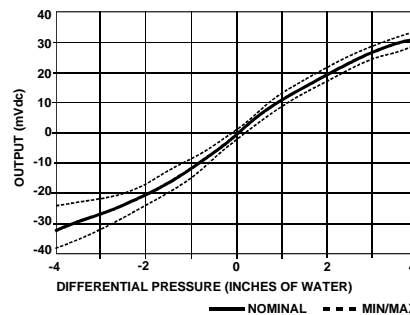


#### OUTPUT VOLTAGE vs. FLOW

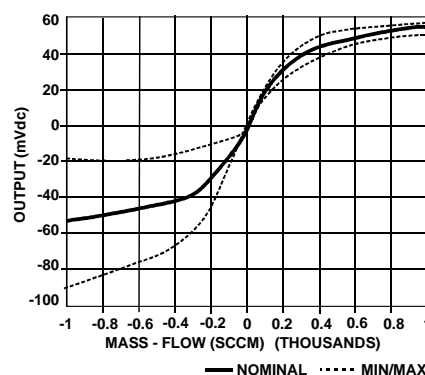
**AWM 2100 V**



**AWM 2200 V**



**AWM 2300 V**



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## SPECIFICATIONS

Type	AWM2100V	AWM2150V	AWM2200V	AWM2300V
Recommended excitation (using test circuit)	10 ± 0.01 Vdc 15 Vdc max.	10 ± 0.01 Vdc 15 Vdc max.	10 ± 0.01 Vdc 15 Vdc max.	10 ± 0.01 Vdc 15 Vdc max. (2)
Power consumption	30 mW	30 mW	30 mW	30 mW
Output voltage trim point	30 mV @ 100 sccm	2.5 mV @ 5 sccm	20 mV @ 2 in H <sub>2</sub> O	50 mV @ 650 sccm
Null voltage	0.00 ± 1.0 mV	0.00 ± 1.0 mV	0.00 ± 1.0 mV	0.00 ± 1.0 mV
Null voltage shift @ -25 to +85°C	± 0.14 mV	± 0.14 mV	± .05 mV	± 0.14 mV
Output voltage shift +25 to -25°C +25 to +85°C	+2.5% Reading -2.5% Reading	+5% Reading -5% Reading	+22% Reading -22% Reading	+5% Reading -5% Reading (4)
Repeatability and hysteresis max.	± 0.35% reading	± 1.0% reading	± 0.35% reading	± 1.0% reading (3)
Response time, max.	3.0 ms	3.0 ms	3.0 ms	3.0 ms (1)
Temperature range				
Operating	-25 °C to 85 °C	-25°C to 85 °C	-25 °C to 85 °C	-25 °C to 85 °C
Storage	-40 °C to 90 °C	-40 °C to 90 °C	-40 °C to 90 °C	-40 °C to 90 °C
Termination 2,54 mm centers (0.100 in centers)	0,64 mm (0.025 in) square	0,64 mm (0.025 in) square	0,64 mm (0.025 in) square	0,64 mm (0.025 in) square
Weight	10.8 gram	10.8 gram	10.8 gram	10.8 gram
Shock rating (5 drops, ea. of 6 axes)	100 g peak	100 g peak	100 g peak	100 g peak
Overpressure, max.	25 psi	25 psi	25 psi	25 psi (5)
Sensor resistance (Pin 2 - Pin 1, Pin 6 - Pin 1)	5 kOhm typ.	5 kOhm typ.	5 kOhm typ.	5 kOhm typ.
Sensor current (Pin 2 - Pin 1, Pin 6 - Pin 1)	0.3 mA	0.3 mA	0.3 mA	0.3 mA

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. Temperature shifts in massflow devices are due to the change of the second order TCR coefficient over temperature.
5. Maximum flow rate to prevent damage to sensing element (includes flow pulse) is 5 LPM.

## OUTPUT FLOW Vs. INTERCHANGEABILITY

AWM2100V			AWM2150V			AWM2200V			AWM2300V		
Flow sccm	Nom. mV	Tol.*± mV	Flow sccm	Nom. mV	Tol.* ± mV	Pres. in H <sub>2</sub> O	Nom. mV	Tol.* ± mV	Flow sccm	Nom. mV	Tol.* ± mV
200	44.50	4.25	20	9.55	3.0	4.00	31.75	3.50	1000	55.50	3.70
150	38.75	3.00	15	7.35	2.0	3.00	26.75	2.50	800	52.90	3.50
100	30.00	1.50	10	4.90	1.5	2.00	20.00	1.20	650	50.00	2.50
50	16.50	2.50	5	2.50	0.6	1.00	11.20	1.80	400	40.50	3.00
0	0.00	1.00	3	1.50	0.9	0	0.00	1.00	200	29.20	3.20
-50	-16.50	4.50	0	0	0.5	-1.00	-11.20	3.00	0	0.00	1.00
-100	-30.00	5.00	-3	-1.50	1.2	-2.00	-20.00	3.30	-200	-28.90	15.00
-150	-38.75	7.65	-5	-2.50	1.2	-3.00	-26.75	5.30	-400	-41.20	26.00
-200	-44.50	9.75	-10	-4.90	3.0	-4.00	-31.75	7.00	-600	-48.20	29.50
			-15	-7.35	4.0				-800	-52.50	32.50
			-20	-9.55	6.0				-1000	-55.00	36.00

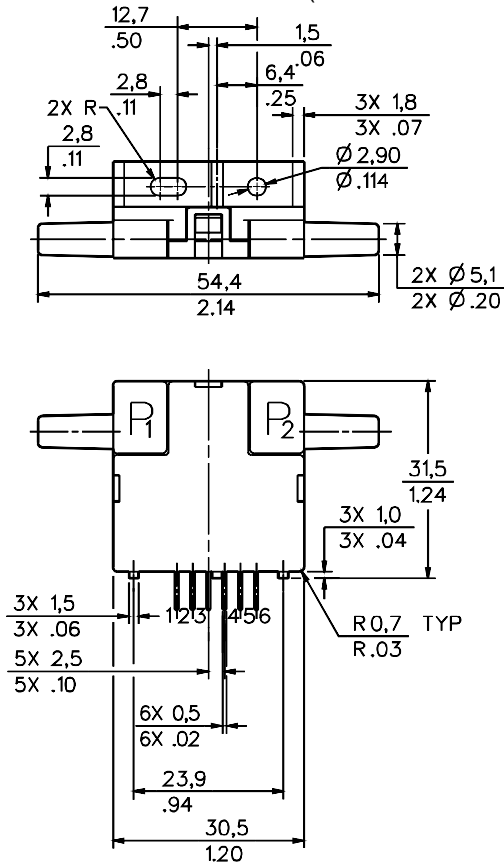
\*The unique design of the microbridge mass airflow sensor accommodates your special application requirements. Custom laser trimming and flow channel dimensioning can conform performance characteristics to specific applications.

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### MOUNTING DIMENSIONS (for reference only) mm/in



**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

Catalog Listing	Description	Flow Range
AWM2100V		±200 sccm / ± 0.2 in H <sub>2</sub> O full scale
AWM2150V		±20 sccm / ± .02 in H <sub>2</sub> O full scale
AWM2200V		± 60 sccm (± 20 sccm) ± 2 in H <sub>2</sub> O full scale
AWM2300V		± 1000 sccm / ± 1.36 in (± 0.1 in) H <sub>2</sub> O full scale

### 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.

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### 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.

### SOLDERING INSTRUCTIONS, continued

#### Wave soldering:

1. Set solder temperature at 250 °C [480 °F] maximum.
2. Run belt at minimum of 1.54 m [5 feet] per minute.
3. Cover tube ends when cleaning.

### 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.

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