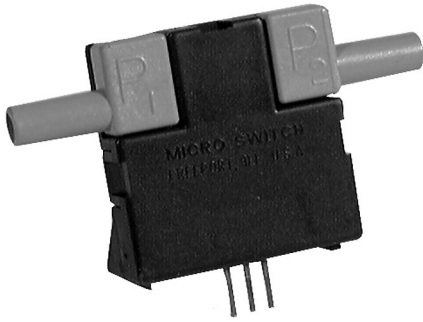


# Airflow Sensors

## Microbridge Mass Airflow/Amplified

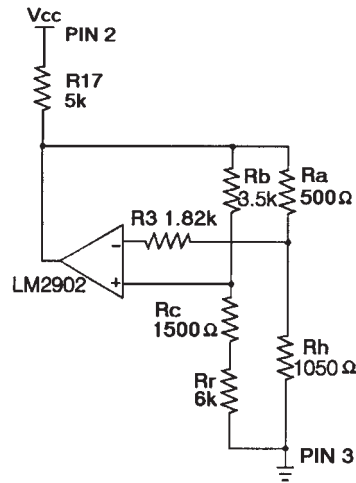


### FEATURES

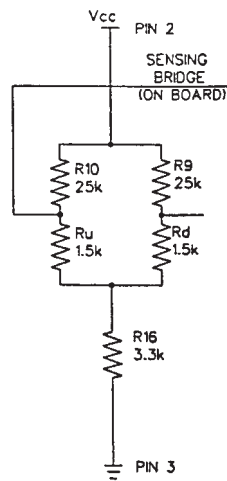
- Laser trimmed for improved sensor interchangeability
- Flow sensing up to 1.0 SLPM
- Low differential pressure sensing

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.

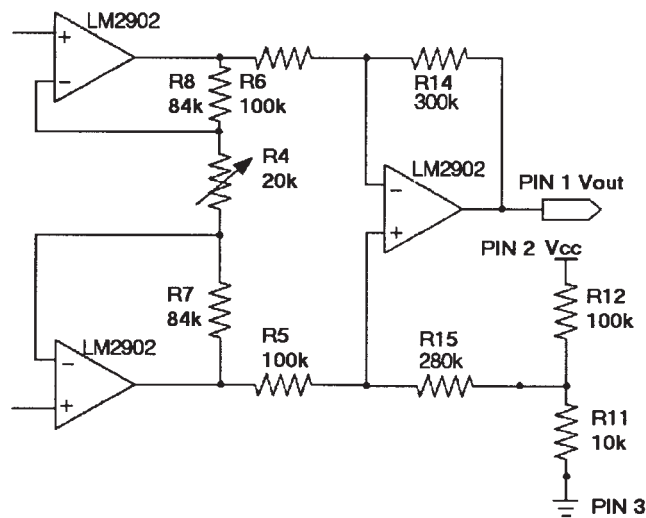
**Figure 1**  
Heater control circuit



**Figure 2**  
Sensing bridge supply circuit



**Figure 3**  
Differential instrumentation amplifier circuit



# Airflow Sensors

## Microbridge Mass Airflow/Amplified

AWM3000 Series

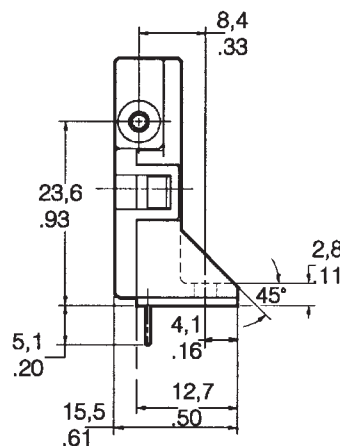
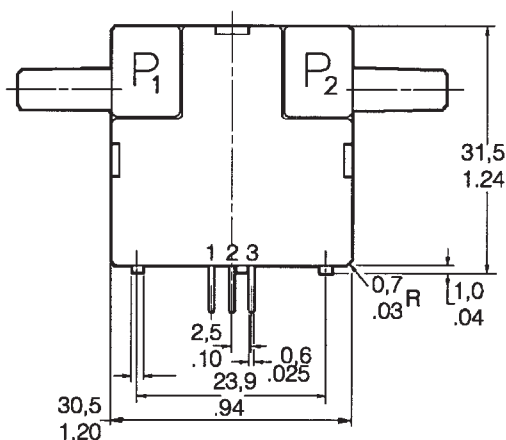
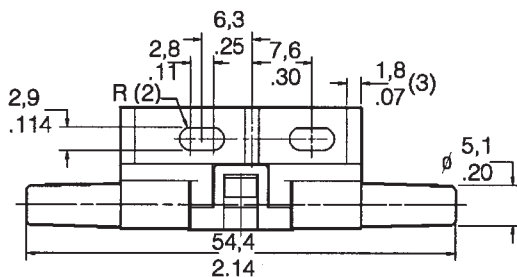
### AWM3000 SERIES ORDER GUIDE (Performance Characteristics @ 10.01 ±0.01 VDC, 25°C)

| Catalog Listings   | AWM3100V   | AWM3150V                   | AWM3200V                              | AWM3300V                   |
|--|--|----------------------------|---------------------------------------|----------------------------|
| Flow Range (Full Scale)                                      | +200 sccm  | +30 sccm                   |                                       | +1000 sccm                 |
| Pressure Range<br>(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.<br>+25° to -25°C, 25° to +85°C      | ±25 mV   | ±100 mV                    | ±25 mV                                | ±25 mV                     |
| Output Voltage Shift, Max.<br>+25° to -25°C<br>+25° to +85°C | -4% Reading<br>+4% Reading   | ±5% Reading<br>±5% Reading | +24% Reading (Note 3)<br>-24% Reading | -5% Reading<br>+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)

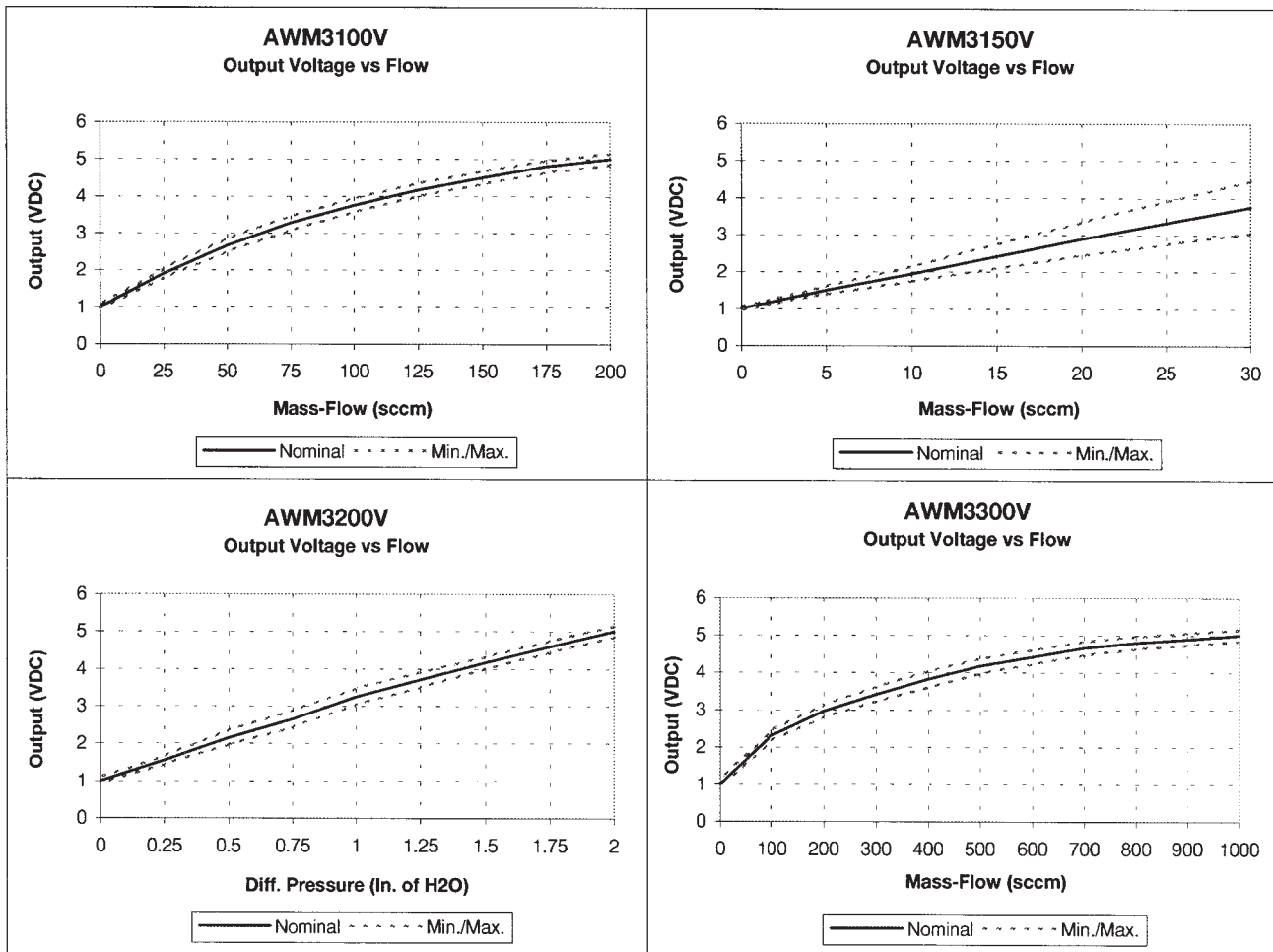
Performance Characteristics @ 10.0 ±0.01 VDC, 25 C

| 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

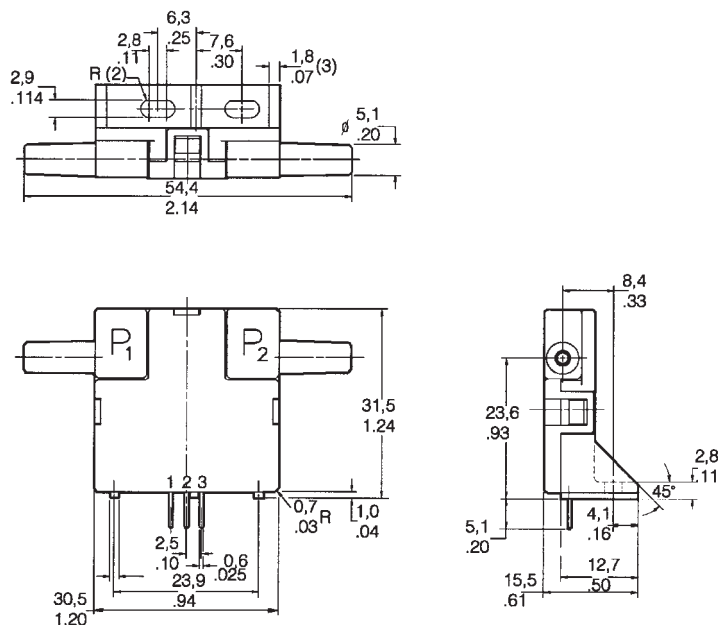
### AWM3000 SERIES ORDER GUIDE (Performance Characteristics @ 10.01 ±0.01 VDC, 25°C)

| 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<br>+25° to -25°C, +25° to +85°C     | ±2 mA DC (max.)  | ±2 mA DC (max.)                       | ±.050 VDC (max.)           |
| Output Shift<br>+25° to -25°C<br>+25° to +85°C | +24% Reading<br>-31% Reading (Note 3)  | +32% Reading<br>-32% Reading (Note 3) | -5% Reading<br>+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 (P<sub>1</sub>) to Port 2 (P<sub>2</sub>) 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)

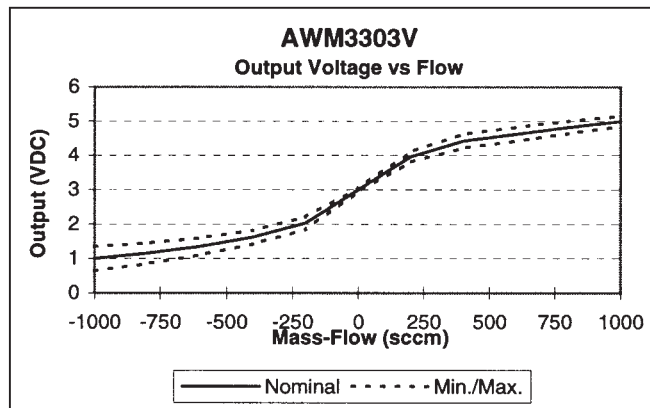
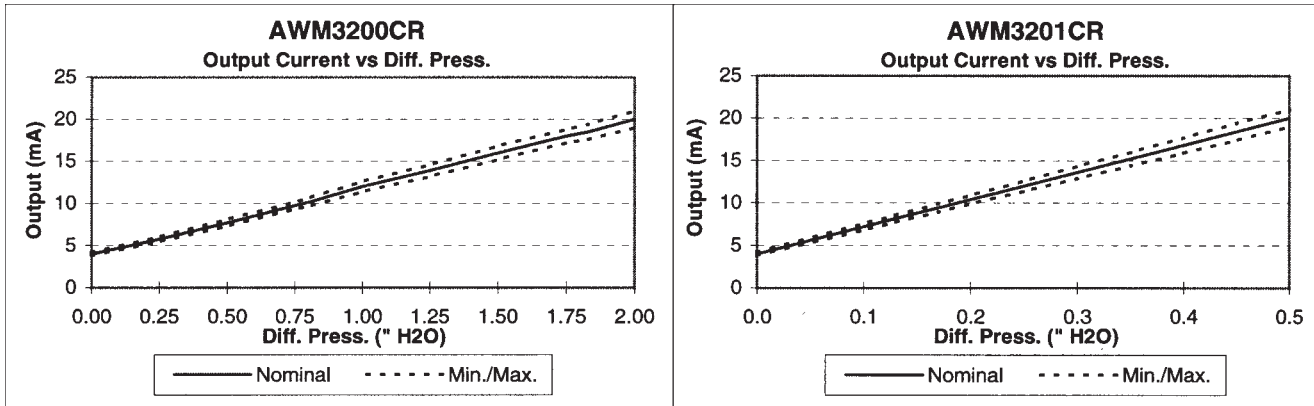
Performance Characteristics @ 10.0 ± 0.01 VDC, 25 C

| AWM3200CR (Note 2) |                              |               |                 | AWM3201CR (Note 2) |                              |               |                 | AWM3303V      |              |             |               |
|--------------------|------------------------------|---------------|-----------------|--------------------|------------------------------|---------------|-----------------|---------------|--------------|-------------|---------------|
| Flow<br>sccm       | Press.<br>" H <sub>2</sub> O | Nom.<br>mA DC | Tol.<br>± mA DC | Flow<br>sccm       | Press.<br>" H <sub>2</sub> O | Nom.<br>mA DC | Tol.<br>± mA DC | Press<br>mBar | Flow<br>sccm | Nom.<br>VDC | Tol.<br>± 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