

Application Notes:

General Purpose Calibration Procedure Using the Bios Met Lab® Series and Bios Gas Flow Delivery System

Introduction:

The flow measurement professional is responsible for calibrating and/or verifying the accuracy of various flow measurement devices. This costly, time-consuming process typically involves sending devices out for calibration or verifying devices in-house. As the leader in primary gas flow measurement, Bios has developed a general purpose calibration procedure that combines the precision and high-speed of our Met Lab® Series of primary piston provers with carefully-selected instruments and gauges to enable the calibration of not only Bios primary standards, but other piston provers, bubble meters and variable area flow meters (rotameters).

Equipment required:

1. Bios Met Lab Series primary piston prover (models ML-800, ML-500 or Definer 220)
2. Bios Gas Flow Delivery System (part number 100-030)

The Bios Gas Flow Delivery System features an on/off valve, precision pressure regulator, high-side and low-side pressure gauges, needle valve, A-B switch (three-way valve), "quick connect" with male and female connectors, and breadboard.



Installation:

Step 1

Connect and/or verify all device connections. The Bios Gas Flow Delivery System comes with in-series, 1/4" tubing connection of the on/off valve, pressure regulator, pressure gauges, needle valve and A-B switch, as well as a "quick connect" with male/female connectors for connection of the on/off valve to the gas cylinder/compressed air

Step 2

Connect one end of the A-B switch to the inlet fitting of the DUT (Device Under Test) and the other end to the inlet fitting of your Met Lab

Step 3

Using the quick connect, connect the on/off valve to the gas cylinder/compressed air. Gas inlet pressure should be approximately 80 to 100 psi

Procedure:

Step 1

Close the needle valve, open the on/off valve and set the gas pressure by adjusting the pressure regulator to above 30 psi

Step 2

Turn on your Met Lab primary piston prover. Through its Setup menu, set the Met Lab's flow readings to either 'Vol' (Volumetric) or 'Std' (Standardized), depending on the reading type of the DUT (Device Under Test). If setting your Met Lab to standardized flow readings, set the Met Lab's standardizing temperature to match that of the DUT's standardizing temperature. For other flow measurement options (such as Continuous readings or the number of readings in the average), consult your Met Lab product manual

General Purpose Calibration continued

Step 3

Open the needle valve, flip the A-B switch to your Met Lab, and begin taking flow measurements with your Met Lab. Based upon your Met Lab's flow measurements, as necessary use the needle valve to adjust the flow to the desired rate

Step 4

Flip the A-B switch to the DUT. Begin taking flow measurements with the DUT

Step 5

Flip the A-B switch to your Met Lab. Begin taking flow measurements with your Met Lab. Since **Step 5** is a direct comparison of your Met Lab's measurements, your **Step 5** results should not differ from your **Step 3** results by more than twice your Met Lab's rated accuracy

Step 6

Determine the accuracy of the DUT using the following formula:

$$\% \text{ Error} = (\text{DUT Reading} / \text{Met Lab Reading} - 1) * 100$$

Step 7

To calibrate the DUT at alternate flow points, repeat **Step 3** and adjust the needle valve and/or the pressure to the needle valve to obtain alternate flow

Application Notes:

- If using this procedure to calibrate variable area gas flow meters (rotameters), for best results consult our separate application note, entitled "Variable Area Gas Flow Meter Calibration Procedure Using Bios Met Lab® Series Primary Piston Provers"
- We recommend taking a minimum of ten flow measurements in an average. The more measurements in the average, the better the calibration results
- Allow the Met Lab to stabilize before beginning a calibration

About Bios

Bios is a recognized leader in **primary** gas flow measurement. We provide products, services and solutions for professionals in diverse disciplines, including environmental protection, occupational health and safety, industrial process control, research and development and calibration laboratories.

Our Butler, New Jersey facility is one of the world's most accurate gas flow measurement laboratories. Since 2004, we've been accredited to the calibration laboratory quality and proficiency standards set forth by ISO 17025, ANSI Z-540 and NIST Handbook 150, through the National Voluntary Laboratory Accreditation program (NVLAP) of the National Institute of Standards and Technology (NIST), the national lab of the United States.

We're pleased to state that our **Scope of Accreditation** uncertainty is $\pm 0.071\%$ of reading for gas flow measurements from 5 to 50,000 scc per minute. A current copy of our accreditation certificate and scope may be found on our website, at:

<http://www.biosint.com/pdf/NVLAP-accreditation.pdf>.

Calibrating a Bios Definer 220

