

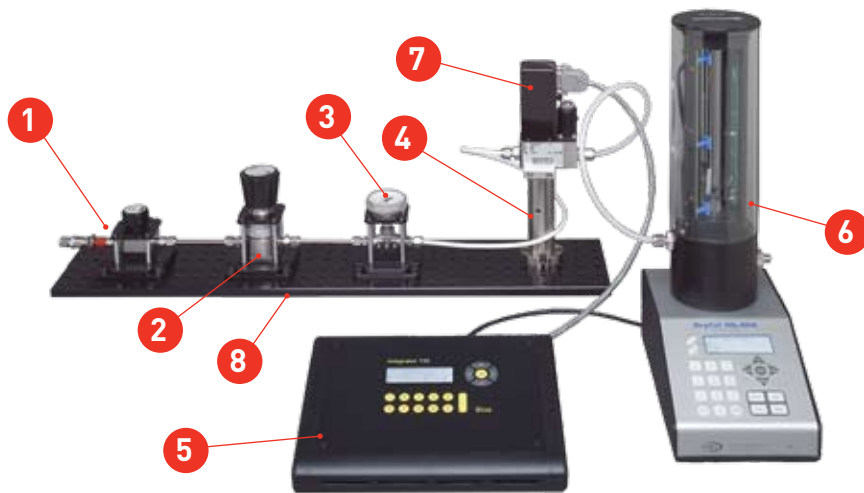
## Application Notes:

# Calibrating MFCs with Bios Met Lab® Series Primary Piston Provers

### Introduction:

The flow measurement professional is responsible for calibrating and/or verifying the accuracy of various flow devices, such as mass flow controllers (MFCs). This costly, time-consuming process involves sending MFCs out for calibration or verifying them in-house.

As the leader in primary gas flow measurement, Bios has developed an on-site calibration solution that combines the precision and speed of our Met Lab® Series of primary piston provers, MFC control system and carefully-selected instruments and gauges to enable fast, precise verifications of MFCs, while removing much of the guesswork and interpretation from the process. This MFC calibration procedure is designed to help the flow measurement professional apply our MFC calibration solution and Met Lab piston prover for optimum, defensible results.



### Equipment required:

1. On/Off Valve
2. Pressure Regulator
3. Pressure Gauge
4. MFC Mounting Stand
5. Bios Integrator™ 110 MFC Command, Control and Readout Device
6. Bios Met Lab (shown with model ML-800)
7. Mass Flow Controller (MFC)
8. Breadboard

For your convenience, Bios offers the MFC Ambient Gas Flow Delivery System (part number 100-025, pictured above) as a pre-packaged MFC calibration solution; please contact Bios or an authorized Bios sales representative for details (Note: Met Lab and Integrator 110 not included).

### Installation using the Bios MFC Ambient Gas Flow Delivery System:

#### Step 1

Verify all device connections. The Bios MFC Ambient Gas Flow Delivery System comes with in-series, ¼" tubing connection of the on/off valve, pressure regulator and pressure gauge, 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

Place the MFC under test on the mounting stand. First check the flow direction before mounting the MFC and then firmly tighten the base plate screws

#### Step 3

Place your Met Lab in the most downstream position of the series. Connect ¼" tubing from the pressure gauge to the MFC's input, and from the MFC's outlet to the Met Lab's inlet

#### Step 4

Connect both the MFC's cable and the Met Lab's serial cable to the designated ports on the back of the Integrator 110 (refer to Integrator 110 manual as necessary)

## MFC Calibration continued

### Procedure:

#### Step 1

Turn on your Met Lab primary piston prover and either your Integrator 110 or alternate MFC control box, as applicable

#### Step 2

Set your Met Lab's measurement type to 'Std' (for standardizing) and set its standardizing temperature to match that of the MFC's standardizing temperature, typically 0.0C or 21.10C (refer to your Met Lab manual as necessary)

#### Step 3

If the MFC requires a sensor factor for the gas under test (if that gas is a surrogate or proxy gas), make sure to change the Met Lab's sensor factor to match that of the MFC (the sensor factor is obtained by the MFC manufacturer)

#### Step 4

Open the on/off valve. Using the pressure regulator, adjust the gas flow's pressure to match that of the MFC's rated inlet pressure. If the indicated gauge pressure is more than the MFC's rated pressure, loosen the connection to the MFC and simultaneously adjust the pressure regulator until the desired pressure is achieved

#### Step 5

Set the flow to the MFC (as applicable, this is done using either your Integrator 110 or the alternate MFC control box)

#### Step 6

Begin taking flow measurements with your Met Lab. Your Met Lab's flow measurements are reflected on your Integrator 110's display, along with the deviation percentage between the MFC and your Met Lab.

### Application Notes:

- Allow the MFC to warm up before beginning a calibration by connecting the MFC to the power supply (or to the Integrator 110; see Integrator 110 manual) before inputting a setpoint
- Allow a specified valve change time before recording the results of consecutive setpoints
- Allow the Met Lab to stabilize before beginning a calibration for optimum measurement results
- The following formula represents the MFC's accuracy in comparison to your Met Lab:  
**% Accuracy (full scale) = (Met Lab measurement - MFC reading)\*100/MFC full scale %**

### 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>.



# Bios

Driving a Higher Standard  
in Flow Measurement<sup>SM</sup>