

## Calibrating MFCs with Metrology Series Primary Piston Provers™ and Integrator Pro Control & Readout Device



### 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, Mesa has developed an on-site calibration solution that combines the precision and speed of our Metrology 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 Metrology Lab piston prover for optimum, defensible results.



### Equipment required:

1. On/Off Valve
2. Pressure Regulator
3. Pressure Gauge
4. MFC Mounting Stand
5. Integrator™ Pro MFC/MFM Control and Readout Device
6. DryCal Metrology Series (shown with model ML-800)
7. Mass Flow Controller (MFC)
8. Flow Bench
9. Personal Computer
10. Two USB-to-RS232 Serial Port Converter, Female-Female, & Male-Female Serial Cables

For your convenience, Mesa offers the MFC Ambient Gas Flow Delivery System (part number 100-025, pictured above) as a pre-packaged MFC calibration solution; please contact Mesa or an authorized Mesa sales representative for details (Note: DryCal 800 and Integrator Pro not included).

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

### Step 1

Verify all device connections. The 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 the MFC's cable to one of the MFC control port channels at the back of the Integrator Pro.

### Step 5

Connect the Integrator Pro's serial cable to the computer running the DryCal Pro software.

### Step 6

Connect the Met Lab's serial cable serial cable to the computer running the DryCal Pro software.

## Procedure:

### Step 1

Turn on your Met Lab primary piston prover and your Integrator Pro.

### 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 0.0°C or 21.10°C (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

From the DryCal Pro software user interface screen, set the flow to the MFC. Refer to the Integrator Pro user manual for set up and operation as necessary.

## Step 6

From the DryCal Pro software user interface screen, command the Met Lab to begin taking flow measurements. Your flow reading from the MFC and Met Lab's flow measurements are reflected on your DryCal Pro software user interface screen, along with the deviation percentage between the MFC flow command, MFC flow reading, and your Met Lab flow measurement.

### Application Notes:

- Allow the MFC to warm up before beginning a calibration by connecting the MFC to the power supply (or to the Integrator Pro; see Integrator Pro manual) before inputting a set point.
- Allow a specified valve change time before recording the results of consecutive set points.
- 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:

$$\% \text{ Accuracy (full scale)} = (\text{Met Lab measurement} - \text{MFC reading}) * 100 / \text{MFC full scale } \%$$



The Butler, N.J. manufacturing facility (pictured above) is Mesa Labs NVLAP accredited ISO 17025 laboratory.