

General Purpose Calibration Procedure Using the DryCal Metrology Series and 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, Mesa has developed a general purpose calibration procedure that combines the precision and high-speed of our Metrology Series of primary piston provers with carefully-selected instruments and gauges to enable the calibration of not only DryCal primary standards, but other piston provers, bubble meters and variable area gas flow meters (rotameters).

Equipment required:

1. DryCal Metrology Series primary piston prover (models DryCal 800, DryCal 500 or Definer 220)
2. DryCal Gas Flow Delivery System (part number 100-030) The DryCal 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 DryCal 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 DryCal.

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 DryCal primary piston prover. Through its Setup menu, set the DryCal's flow readings to either 'Vol' (Volumetric) or 'Std' (Standardized), depending on the reading type of the DUT (Device Under Test). If setting your DryCal to standardized flow readings, set the DryCal'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 product manual.

Step 3

Open the needle valve, flip the A-B switch to your DryCal, and begin taking flow measurements. Based upon your DryCal'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 DryCal. Begin taking flow measurements. Since Step 5 is a direct comparison of your DryCal's measurements, your Step 5 results should not differ from your Step 3 results by more than twice your DryCal's rated accuracy.

Step 6

Determine the accuracy of the DUT using the following formula:

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

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 Metrology 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 DryCal to stabilize before beginning a calibration



Mesa's Butler, N.J. manufacturing facility (pictured above) is the only NVLAP accredited ISO 17025 laboratory serving the occupational health and safety industry. With the lowest gas flow measurement uncertainties of any commercial laboratory, Mesa provides you with the legal protections and peace of mind valued in today's litigious business environment.