

ML One™ Description and Specifications

0.15% Accuracy Primary Flow Standard



Bios

Driving a Higher Standard
in Flow MeasurementSM

Primary Gas Flow Measurement

Enhance productivity - and your bottom line - with the ML One™

Product Capabilities:

- Corrosive gas capability
- Automatic flow range selection
- Faster readings
- Enhanced accuracy
- Greater portability



Benefits:

- Improved operational efficiency (work smarter and faster)
 - Less time changing cells
 - Faster readings
 - Less down time (by taking device to where it is needed)
 - More time for other job responsibilities
- Greater versatility (do more with a single device)
 - Multiple gases
- More confidence (one less thing to worry over)
 - Consistently defensible results
 - Bios performance history
 - Exceptional product support



Key technical features:

- Innovative horizontal tube design – no 'dead piston time' for faster readings
- Diamond-based coatings for higher efficiency, longer use, reduced leakage concerns, reduced piston sticking
- Touch-pad operation – simpler, faster, more intuitive to operate

“Operation of the ML One™ is intuitive and simple, a typical gas flow measurement only requires the user to connect the gas flow and touch measure on the screen followed by start.”

Highlights:

The Bios ML One™ provides primary gas flow measurement with an uncertainty of (0.15% of reading and +/- .01 ccm) across a flow range of 5 to 50,000 ccm. The ML One™ is an all-in-one measurement instrument for use in a laboratory or transported on a cart for factory floor measurements. It is designed to measure corrosive gases compatible with wetted path materials: (304- 316 stainless steel, borosilicate glass, Teflon®, and AFLAS® elastomeric). Three tubes sit horizontally in the instrument and are fitted with low mass – borosilicate glass pistons with a low friction coating that oscillate between two detectors to quickly and accurately measure gas flow rates.

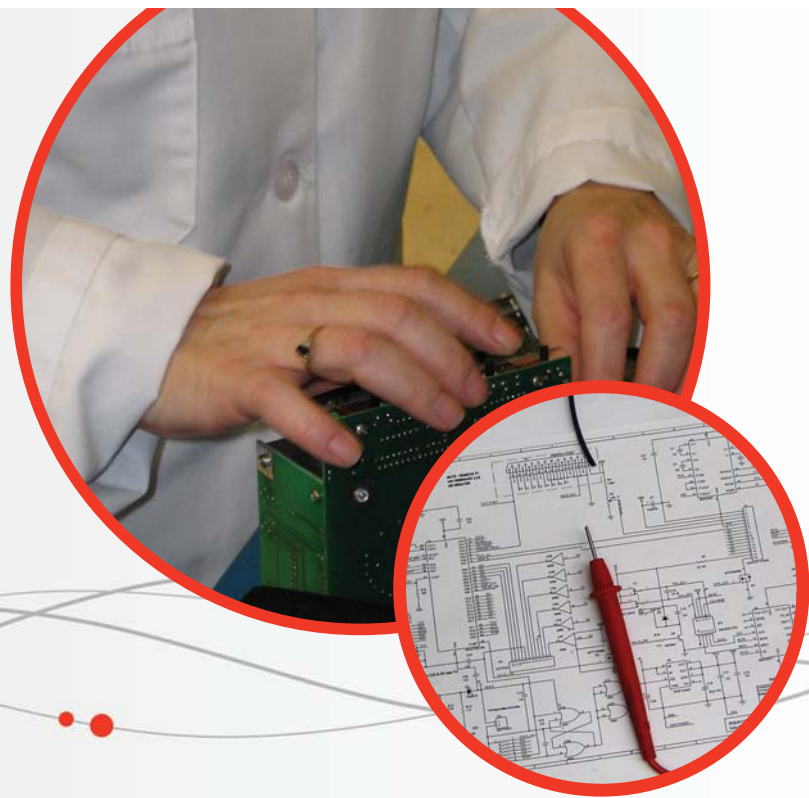
Product Description:

The ML One™ offers primary gas flow measurement with an uncertainty of .15% and +/- .01 ccm in a single portable unit that is simple to operate and compatible with all but the most corrosive gases. The ML One™ is the result of 20 years of innovation in primary gas flow measurement at Bios International. Three measurement tubes inside the ML One™ are oriented horizontally and a precision machined low mass, low friction coated piston inside the tube is displaced by the gas flow stream. Piston detectors record the time required to displace the piston a known distance and from this flow rate is calculated. The largest tube and piston (~51mm diameter) measures flow rates from 50,000 ccm to 3,500 ccm. The medium tube and piston (~24mm diameter) measures flow rates from 5,000 ccm to 350 ccm and the smallest tube and piston (~10mm diameter) measures flow rates from 500 ccm to 5 ccm. The ML One™ will auto-select the tube needed as the flow rate changes. The flow rating for each tube overlaps with another tube allowing for cross checking flow measurements with two tubes to verify instrument accuracy.

When a gas flow measurement is initiated two normally closed valves for the selected tube open and four flow control valves operate directing the gas

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flow. The piston oscillates between two piston measurement detectors and the time interval required for the piston to sweep the calibrated tube volume provides the volumetric flow rate. A temperature transducer located at the gas stream entrance to the tube measures gas temperature. A precision pressure sensor measures gas pressure in the measurement tube. From the gas temperature, gas pressure and a compressibility factor the volumetric gas flow rate is converted to a standardized gas flow rate. Compressibility factor is a small correction factor applied during conversion of volumetric flow to standardized flow required for best accuracy when measuring reactive gases. When measuring non-reactive or inert gases the compressibility factor is negligible and can be ignored. To apply a compressibility factor correction the user selects the gas species being measured from a table of gases in the ML One™. Bios uses compressibility factors obtained from the NIST database of gas properties REFPROP.

Control of the ML One™ is through a touch panel on the front panel or through commands sent through the ML One™ Dataport. Operation of the ML One™ is intuitive and simple, a typical gas flow measurement only requires the user to connect the gas flow and touch measure on the screen followed by start. The ML One™ will auto-select the correct tube and display the flow rate. The ML One™ is designed to be transportable on a cart to allow users to do precision gas flow measurements on the factory floor. No longer is it required to remove mass flow controllers or other equipment from factory tools and take them to a laboratory to perform accurate gas flow measurements. Now users can take the ML One™ to factory tools and verify gas flow rates in situ.

The pistons used in the ML One™ are precision machined from Borosilicate glass, engineered for low mass and are have a surface with a chemically



Reliable

Over 15 years of Proven DryCal® Technology



Accurate

Baced by ISO17025; NVLAP accredited, ANSI Z-540, NIST Handbook 150



Flexible

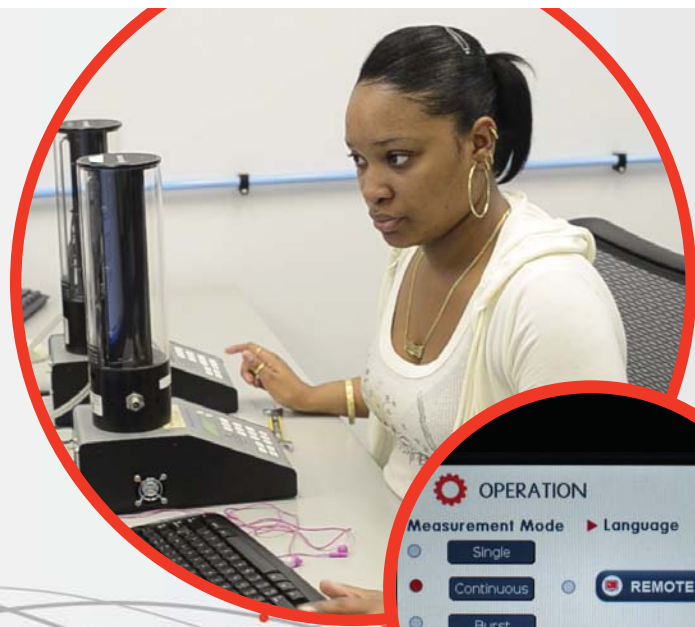
Portable, modular design: integrated software easily customized to your needs



Convenient

Push button simplicity; dry - no mercury or other liquids

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resistant, low friction, wear resistant coating. The combination of low mass and low friction results in a piston that requires less than .002 PSI of gas pressure to be displaced. With almost no pressure needed to displace the piston the gas leakage around the piston to tube clearance becomes insignificant. The low mass piston produces a piston with faster response time, and an DryCal that produces minimal pressure changes in the gas stream during the measurement cycle. With the faster response time and taking flow measurements in both directions as the piston translates between the measurement detectors gas flow readings are obtained significantly faster than previously DryCals.

“With the faster response time... gas flow readings are obtained significantly quicker than previous DryCals.”

New diagnostic capabilities have been added to the ML One™ including the ability to check the internal pressure transducer against an external reference, cross check flow readings at cross over flow points between two tubes, compare temperature readings between the three internal temperature transducers, check the last calibration date and number of measurement cycles since the unit was last calibrated, and procedures to check the ML One™ for leakage.



ML One™ Product Specification	
Flow Range	5-50,000 sccm
Low tube	5-500 sccm
Medium Tube	350-5,000 sccm
High Tube	3,500 - 50,000 sccm
Measurement Gas Pressure Range	Atmospheric Pressure +/- .5PSIA
Temperature Range - Operating	15 to 30 C
Temperature Sensors (one per Tube)	Accuracy +/- .03% (max), sensor is located in incoming gas stream
Temperature Range - Storage	0 to 70 C
Pressure Transducer	0-16 PSI(absolute), accuracy .05% FS
Gas Compatibility / Wetted path materials	Gases compatible with (316/304 SS, borosilicate glass, Teflon, AFLAS elastomeric)
Compressibility Factor Correction	User selection of gases to apply compressibility factor correction for non-ideal gas behavior
Language Selection for Display	English, German, Spanish, Italian, Dutch
Power Supply	External Power Module
	Input: 100-240VAC, 1.5A 50-60 Hz
	Output: 24VDC, 3.0A
User Interface	Touch screen or via Commands through data port
Data Port Connections	RS-232 and USB
Inlet and outlet fitting	1/2 inch VCR fitting
Approximate Measurement Interval	flow dependent (.5 - 60 seconds) typical 2 seconds
Dimensions	22" (56cm) w x 15" (38cm) h x 13" (33cm) d
Weight	62 lbs – 28 kilograms
Warranty	1 year
ROHS Compliant	YES
Measurement Uncertainty	
Standardized Flow	0.15% of reading and +/- 0.01 sccm
Volumetric Flow	0.15% of reading and +/- 0.01 ccm



The Bios facility in Butler, N.J., (pictured above) is one of the world's most accurate ISO 17025 laboratories serving the environmental and process control industries. With the lowest gas of any commercial laboratory, Bios provides you with the legal protections and peace of mind valued in today's litigious business environment.

NVLAP[®]
 NVLAP Lab Code 200661

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