



Frequently Asked Questions (FAQ)

ProFLOW 6000

Electronic Flowmeter

1. Why do I see a difference between the gas flow reading of the ProFLOW 6000 flowmeter and the gas flow reading of a gas chromatograph (GC)?

All flowmeters have some degree of flow impedance. Connecting a flowmeter to a flow control system (including a GC) will present this impedance to the system as a load. Loading the system changes the system dynamics for which it was factory tuned. This will cause the flow control system to react differently and can result in a flow output that differs from the intended setpoint.

Additionally, some GCs reference flow rates to normal temperature and pressure (NTP) or 25 °C and 1 atmosphere. This means that the flows displayed on the front of the GCs are only valid for the aforementioned reference conditions. The actual flow (which volumetric flowmeters display correctly) will differ based upon how much the present conditions vary from those reference conditions.

2. Why do I see a difference between the reading of the ProFLOW 6000 flowmeter and the reading of another flowmeter?

All flowmeters present some level of flow impedance, and the degree of impedance differs among meters. When connected to a flow source, the difference in impedance loads the system to varying magnitudes. This will usually result in a change of flow from the source. Although each meter will read and display the current flow from the source respectively, the source flow will change relative to the degree of loading. For this reason, it is inappropriate to “check” the gas flow measurement of one volumetric flowmeter against that of another.

3. Why do I see a difference between the reading of one ProFLOW 6000 flowmeter and another ProFLOW 6000 flowmeter?

The ProFLOW 6000 flowmeter has a flow accuracy of $\pm 2\%$ of the reading or 0.2 mL/min., whichever is greater. So, for a flow rate of 100 mL/min., sequential measurements from 2 different ProFLOW 6000 flowmeters may read 98 mL/min. and 102 mL/min. and still be within flowmeter accuracy specifications.

4. What is the difference between mass flow and volumetric flow?

Mass flow is the movement of a fluid over time quantified relative to the fluid's mass. Volumetric flow is the movement of a fluid over time quantified relative to the fluid's volume. From a practical standpoint, volumetric flow will vary with changes in temperature and pressure, while mass flow is unaffected by these changes.

5. How is the unit of standard cubic centimeters per minute (sccm), which sounds like a volumetric unit, actually a mass flow unit?

The sccm unit is a little confusing. It is typically used in meters to allow users to easily derive a corresponding traditional mass flow unit from a measurement that is not native to the meter's sensing technology. These meters will typically use a native volumetric flow sensor to measure a flow quantity. Then they compensate or “standardize” that measurement to a specific reference condition often referred to as standard temperature and pressure (STP). This standardized flow rate allows a user to easily reference a density for their known gas composition and use it to calculate an equivalent mass flow in the units of their choosing. It's important to understand that this mass flow must be derived since it isn't physically measured by a mass flow sensor.



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6. My other gas flowmeters display flow in sccm units, how do I set the ProFLOW 6000 flowmeter to do the same?

The unit of sccm is a mass flow unit. The ProFLOW 6000 is a native volumetric gas flowmeter and hence uses the volumetric unit of mL/min., which is equivalent to ccm, but not equivalent to “standard” cubic centimeters per minute (sccm).

7. What is flow compensation?

Flow compensation is the act of determining the degree to which a particular volumetric flow rate would change if the temperature and/or pressure were to change.

8. For which gases is the ProFLOW 6000 flowmeter calibrated?

The ProFLOW 6000 flowmeter uses a native volumetric flow sensor that is nonspecific to gas composition. Hence, it does not require calibration to any particular gas composition. It will natively measure the volumetric flow of any clean, dry, non-corrosive gas.

9. What standard temperature and pressure (STP) does the ProFLOW 6000 flowmeter reference?

The ProFLOW 6000 flowmeter displays a gas flow measurement that is acquired from a native volumetric flow sensor. This measurement is the actual volumetric flow at the temperature and pressure that existed during the time of measurement. The ProFLOW 6000 does not compensate or standardize the flow to an STP.

10. Why does my ProFLOW 6000 flowmeter read “under range”?

The range of the meter is 0.50 to 500 mL/min. Connecting the meter to any flow stream below 0.50 mL/min. will result in the display of “under range”.

11. My ProFLOW 6000 flowmeter displays “Calibration--expired--” when I turn it on. Does it still work?

A display of “Calibration—expired—” means that the period of time, for which the meter was calibrated, has now elapsed. The meter will still continue to operate but its accuracy specifications are no longer guaranteed until it is recalibrated. When the flowmeter calibration expired indicator displays, the flowmeter can be recalibrated by requesting recalibration (cat.# 22656-R) from Restek Corporation.

12. Do I really need to send my ProFLOW 6000 flowmeter back to Restek Corporation for calibration? Can I send it somewhere else for calibration or calibrate it myself?

Through years of development efforts, Restek Corporation has produced a state-of-the-art system and procedure for calibrating ProFLOW 6000 flowmeters. The delivery of the flowmeter accuracy specifications for this meter is only possible through a complex and intensive calibration effort. While the details of the procedure are proprietary to Restek Corporation, an overview of the procedure can be found in the National Institute of Standards and Technology (NIST) traceability document (available at www.restek.com). The equipment and methods for this procedure are exclusive to Restek Corporation.

13. My ProFLOW 6000 flowmeter displays a constant measurement (typically between 100-200 mL/min.) regardless of the actual flow. What’s wrong with it?

Usually, this type of response is indicative of a flow transducer that has been damaged by a very high flow over-range condition. It should be returned to Restek Corporation for evaluation and repair.

14. Where can I learn more about flow regimes than this simple FAQ provides?

The following technical articles at www.restek.com/FAQflow explain these as well as other gas flow concepts in more detail.

- A Primer on Control Systems
- A Primer on Gas Flow

If your question doesn’t appear on the list, please contact **Restek’s Technical Support** team:

United States: support@restek.com

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