Agilent Flowmeter ADM2000

Operating Instructions

Agilent Technologies

Notices

Manual Part Number

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Warranty

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Agilent Flowmeter ADM2000

Packing List

Thank you for choosing Agilent's ADM2000 Flowmeter. When unpacking the box, please make sure it contains the following items:

1	ADM2000 Flowmeter (battery included)
1	Instruction Manual
1	Power Adapter
1	RS232 Cable Adapter

Principle of Operation

The ADM2000 provides continuous, real time measurements of **NON-CORROSIVE AND NONFLAMMABLE GAS FLOWS .** Unlike bubble flowmeters, the ADM2000 operates without liquids, bubbles or glass parts. When activated, a solenoid actuated valve interrupts the gas flow momentarily. The gas flow moves a diaphragm in proportion to the flow rate. This movement is transformed by the microprocessor into a digital value which is displayed instantly. The ADM2000 provides two different types of flow measurement: volumetric flow (mL/min) and mass flow (sccm). Mass flow values are calculated from the volumetric measurements by correcting for temperature and pressure.

Adjusting the Viewing Angle

The flip down wire stand will give you a better viewing angle when the ADM2000 is placed above bench level. Simply pull the stand down until it is in the locked position.

Menu Button

The Menu button is used to scroll through and select different operational modes. Briefly press the Menu button until your choice appears on the display. Once the desired mode is displayed, the On button may be pressed momentarily or the unit will automatically enter the selected mode in 5 seconds. The available modes are as follows:

1 **Volumetric Flow Mode / Split Ratio**
This is the default mode on power up. In this mode, the flow rate is displayed in mL/min.

2 **Mass Flow Mode**
In this mode, the volumetric flow rate is corrected for atmospheric pressure and ambient temperature. The flow rate is displayed in sccm, standard cubic centimeters per minute.

Momentarily pressing the On button while in any mode will return the flowmeter to the volumetric flow mode.

Auto-off

When the unit is turned on, the default is auto-off engaged. This means the following: every time the unit is activated, a “power-off” cycle begins, lasting 10 minutes. If the flowmeter is not used during this time, the unit will turn off. To conserve battery power, turn off the instrument manually by pressing and holding the On button until the “sign off” message appears.

The Menu button is used to disable this feature. On initial power up while the display shows WARMUP, press and hold the Menu button until AUTO-OFF DISABLE is displayed. The flowmeter will now operate continuously until it is manually turned off.

Taking a Flow Measurement

Make sure that the flow to be measured is within the range of the flowmeter. Over ranging the flowmeter can damage the transducer.

Briefly press the On button. The display will flash the message WARMUP . During this time, the microprocessor will run a self-diagnostic test to ensure the system is functioning correctly. **Always turn the flowmeter on before connecting it to a flow source.** Select the desired mode if other than volumetric flow is needed. Connect the flexible tubing to the gas source to be measured, wait for the reading to stabilize (1 - 2 seconds) and record the reading. To conserve battery power, turn off the instrument manually by pressing and holding the On button until the “sign off” message appears.

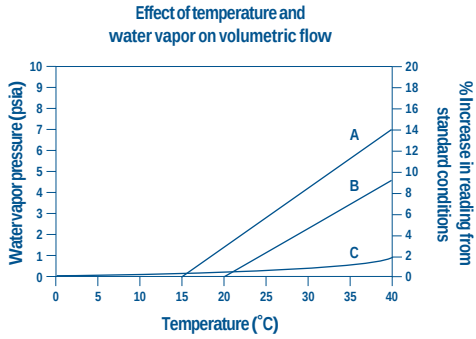
NOTE Low flows (less than 1 mL/min) may take up to 5 seconds for the reading to stabilize.

Important

When compared with readings from the ADM2000, measurements taken with bubble-type flowmeters may show a difference. This is not a problem with your new ADM2000.

As a consequence of the ideal gas law, measurements made with both soap bubble meters and the ADM2000 are temperature sensitive. However, bubble-type flowmeters add water vapor to the gas being measured which introduces error into the flow rate measurement.

Even when accurately calibrated, soap bubble meters typically read slightly higher than the ADM2000. The higher readings arise from relatively high concentrations of water vapor present in the soap bubble apparatus. At room temperature, water vapor can raise readings by nearly 4%. This unfortunate property is amplified by the effect of temperature. As the measured gas or the flowmeter itself is warmed, the amount of water vapor increases, and the readings can be much higher than the true flow rate. Figure 1 shows the effect of water vapor on volumetric flow measurements. Since the ADM2000 is **bubble-free**, this error is not introduced into the flow rate measurement.



A % increase in volumetric flow due to temperature and water vapor pressure

B % increase in volumetric flow due to temperature only

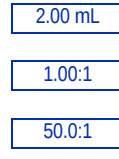
C Water vapor pressure

Figure 1 Effect of temperature and water vapor on volumetric flow.

Reading and Setting a Split Ratio

Turn the unit on by briefly pressing the On button. Connect the flexible tubing from the ADM2000 to the GC column gas flow*. When the reading stabilizes (1-2 seconds), briefly press the On button. (Note: The display will show an error message if the flow being measured is less than 0.5 mL/min.)

The reading is now stored in memory, and the display will read 1:1 . Disconnect the flexible tubing from the GC column flow and connect it to the split vent. The display will now read the ratio directly. The exact ratio can be dialed in by simply adjusting the flow of the split vent until the required ratio is displayed.



Typical display sequence for setting a 50.0:1 split ratio with a 2.00 mL/min column flow.

Returning to Single Flow

To return to single flow operation, briefly press the On button. You can also return to single flow operation by pressing the Menu button and scrolling through the options to volumetric flow mode.

* Accurate column flow rates can only be determined when detector gases have been turned off.

Autoranging Display

The microprocessor automatically adjusts the resolution of the display in response to various gas flow ranges as follows:

Flow (mL / min)	Display resolution (mL / min)
0.50 - 9.99	0.01
10.0 - 99.9	0.1
100 - 1000	1.0

Low Battery Indicator

When the LOWBAT symbol is displayed, replace the battery. (We recommend a standard 9V alkaline battery.) Install it by removing the battery cover on the back of the case. Change the battery and replace the cover.

RS232 Data Port

The ADM2000 is an RS232 output device. That is, it is capable of outputting ASCII data through an RS232 standard serial interface. Data from your flowmeter can be collected using the RS232 interface and your PC's serial (RS232) port. Included with the flowmeter is an RS232 cable with a DB25 connector wired as a null modem. If your computer has a DB9 connector, you will need to buy an adapter that converts from DB25 to DB9. Once connected, data is easily collected using one of many commercially available communication programs, such as PROCOMM® Plus by DataStorm Technologies, Inc.or the Windows® Terminal program by Microsoft. You will need to set your communication parameters to:

9600 Baud
8 Data bits
No parity
1 Stop bit

ADM Flowmeter Control Software is available from the Agilent website free of charge. This trending and archiving software for the ADM2000 and ADM3000 is available in two versions to help you collect test data. To download, go to www.agilent.com/chem and look in the technical support section under ADM Flowmeters.

Other options include purchasing a software wedge, which directly imports serial data to the keyboard buffer, or writing a BASIC program to capture the data using a COM port.

NOTE When using the RS232 data acquisition capability of the ADM2000, it is advisable to disable the auto-off feature. See previous section on auto-off.

Replacing Flexible Tubing

When replacing the flexible tubing please order P/N 701-0016. This tubing is available by the foot; a minimum of 2 feet is necessary. If tubing other than this is used please cut to 18 inches (± 2 inches) in length. **Important:** If flows to be measured are less than 200 mL/min and a greater length of tubing is desired (greater than 18 inches) please order tubing extension kit P/N 220-1179. If tubing greater in length than 18 inches is used without this kit, errors in the displayed flow value may occur with flows under 200 mL/min.

Replacement Power Transformers and Adapter Cables

To order a replacement 100-240 V universal power transformer, order P/N 5185-5924. The transformer must be used with the RS232 Cable Adapter that is supplied with the unit. For a replacement RS232 Cable Adapter, order P/N 007-1175.

Recalibration and Repair Service

To have your ADM2000 recalibrated or repaired, consult the Agilent website for more information. Go to www.chem.agilent.com and do a quick search for ADM Flowmeters. Once there, look in the Technical Support section for the recalibration/repair details.

Product Specifications

- Flow range: 0.5 to 1000 mL/min, autoranging
- Accuracy ± 3% of reading, or ± 0.2 mL/min, whichever is greater.
- Tubing temperature range: -62°C to 110°C
- Operating temperature range: 0°C to 45°C
- Power: 9V battery (alkaline), or AC power adapter
- Display: 16 character alphanumeric
- Automatic power off
- Split ratio mode with continuous split flow rate reading
- NIST traceability
- Compatible with non-corrosive and non-flammable gases
- Self-checking power on sequence
- Volumetric and mass flow measurements
- RS232 output
- Each flowmeter individually computer calibrated

Technical Support

Agilent's Technical Support Specialists are chemists with years of laboratory experience. They can provide you with in-depth knowledge and experience. Contact Agilent technical support; call 1-800-227-9770 in the US and Canada or call your local Agilent sales office or to contact Technical Support on the Internet, go to (www.agilent.com/chem).