



Agilent CrossLab CS  
**ADM Flow Meter**

# Operation Manual



# Notices

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### CAUTION

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### WARNING

**A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.**

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# Introduction



Figure 1. The Agilent CrossLab CS ADM flow meter front screen buttons.

The Agilent ADM flow meter is controlled with two buttons on the front of the instrument directly below the screen, as shown in **Figure 1**. The functions of these buttons are described in this section.

## Power/Mode button

The Power/Mode button is used to switch the flow meter on and off, as well as to scroll through and select different operational modes.

- To turn on the instrument, briefly press and release the Power/Mode button.
- To turn off the instrument, press and hold the Power/Mode button for three seconds.
- To scroll through the available modes, when the instrument is on, briefly press and release the Power/Mode button.

## Enter/Clear/Toggle button

The Enter/Clear/Toggle button is used to access additional functionality within the operating modes.

- To store flow measurements in **Volume** mode and **Mass** mode, briefly press and release Enter/Clear/toggle button.
- To set a reference value in **Split** mode, briefly press and release Enter/Clear/Toggle button.
- To change the settings in **Info** mode, press and hold the Enter/Clear/Toggle button for two seconds.

## ADM Flow Meter

### Switching the ADM flow meter On and Off

## Switching the ADM flow meter On and Off

With the flow meter powered off, briefly press and release Power/Mode button to turn the unit on. The screen will flash the words **ADM Flow Meter** for approximately three seconds, then begin operating.



Figure 2. The initial screen display for the Agilent ADM flow meter.

With the unit powered on, press and hold the Power/Mode button for three seconds to power down the unit.

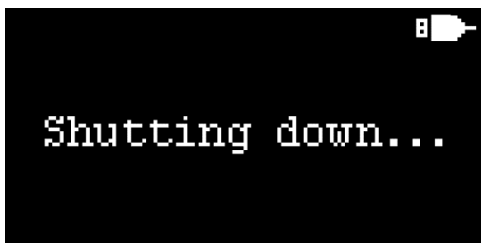


Figure 3. The shutdown screen for the Agilent ADM flow meter.

# Notes, Cautions, and Warnings

#### NOTE

- The ADM flow meter cartridge is a calibrated device.
  - Using the USB port to supply power does not recharge the installed batteries.
  - The ADM flow meter can also be powered by rechargeable batteries, but the battery indicator may not display correctly.
- 

#### CAUTION

- Flows exceeding 750 mL/min may damage the cartridge and void the warranty.
  - Do not use the ADM flow meter in temperatures outside of its specified operating range.
  - The ADM flow meter should not be misused for other purposes.
  - The measurement calibration can be affected if the instrument is exposed to temperatures above 50 °C for extended periods of time.
  - Please inspect the temperature label attached to the inside of cartridge packaging to verify that your cartridge has not been damaged in shipment. A gray circle is acceptable, a black circle indicates that the cartridge may have been exposed to an extreme temperature.
  - Please contact Agilent Technical Support if your cartridge is delivered with a temperature indicator that is black.
  - Do not use the flow meter to measure corrosive gases.
- 

#### WARNING

- Use only a 5 V DC, 0.5 A USB power source and the supplied USB cable to run this device.
  - Do not use the ADM flow meter as safety equipment.
-



## ADM Flow Meter

### Notes, Cautions, and Warnings

#### WARNUNG

- Verwenden Sie zum Aufladen dieses Geräts ausschließlich eine 5v DC, 0,5A USB-Stromquelle und das mitgelieferte USB-Kabel.
  - Verwenden Sie den ADM-Durchflussmesser nicht als Sicherheitsausrüstung.
- 

#### ATTENTION

- Utilisez uniquement une source d'alimentation USB 5 V CC, 0,5 A et le câble USB fourni pour charger cet appareil.
  - N'utilisez-pas le débitmètre ADM comme équipement de sécurité.
- 

#### ATTENZIONE

- Per caricare questo dispositivo, utilizzare solo una fonte di alimentazione USB da 5 V CC, 0,5 A e il cavo USB in dotazione.
  - Non utilizzare il misuratore di portata ADM come apparecchiatura di sicurezza.
- 

#### ADVERTENCIA

- Para cargar este dispositivo, use solamente una fuente de alimentación USB de 0,5A, DC 5V y el cable de alimentación suministrado.
  - No utilice el flujómetro ADM como equipo de seguridad.
- 

#### 警告

- 仅使用 5v DC、0.5A USB 电源和随附的 USB 电缆为本设备充电。
  - 请勿将 ADM 流量计用作安全设备。
-

# Principles of Operation

The ADM flow meter provides continuous, real-time measurements of dry gas flows, such as those used for gas chromatography. Unlike bubble flow meters, the flow meter 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 flow meter's electronics into a digital value, which is displayed on the flow meter's screen. The flow meter provides two different types of flow measurements: volumetric flow (mL/min) and mass flow reported in standard cubic centimeters per minute (sccm). Mass flow values are calculated from the volumetric measurements by correcting for ambient temperature and atmospheric pressure, and reporting the flow rate referenced to 0 °C and one atmosphere of pressure, using digital temperature and pressure sensors installed in the mainframe of the flow meter.

The flow meter uses a replaceable cartridge that contains all parts subject to calibration. This eliminates the need to ship the entire meter back to the factory to maintain its calibration. The cartridge calibration is valid for a period of one year from its first use. A new, calibrated cartridge can be ordered in advance, and installed when necessary.

When the flow meter is powered on with a new cartridge installed, the current date is written to the cartridge's memory based on the mainframe's internal clock. Each time the flow meter is turned on, the meter will compare the current date to the initial turn on date of the cartridge. If the initial turn on date is more than a year from the current date, the flow meter will flash a notification to the user that the calibration has expired. The flow meter will still function with an expired calibration. This eliminates downtime, enabling you to keep working. See **Installing and Replacing the Cartridge** on page 31.

The flow meter is powered by three AA alkaline batteries. Power can also be supplied via the micro USB port located on the side of the unit.

# Product Specifications

**Table 1** Agilent ADM flow meter specifications

Parameter	Value
Flow range	0.5 to 750 mL/min, auto-ranging
Accuracy*: 0.5 to 500 mL/min	±2% of reading, or ±0.2 mL/min, whichever is greater.
Accuracy*: 501 to 750 mL/min	±3% of reading
Tubing Temperature Range	-62 to 110 °C
Operating Temperature Range	0 to 45 °C
Storage Temperature Range <sup>†</sup>	-15 to 50 °C
Power	(3) AA batteries (alkaline), or USB power
Display	128 × 64 pixels monochrome with 16 gray scales

\* When verified at ambient temperature of 20 to 24 °C at sea level. Optimum performance is in the range of 15 to 35 °C. Accuracy may decrease outside of these ranges.

† Damage to the instrument may occur if it is exposed to temperatures greater than 50 °C, leading to inaccurate results.

# Display

The flow meter has a bright OLED display with a battery strength indicator.



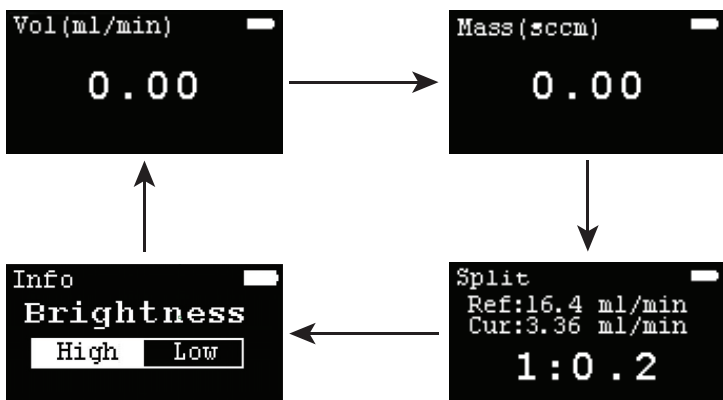
The unit automatically adjusts the resolution of the display in response to various gas flow ranges as follows:

Flow (mL/min)	Display Resolution (mL/min)
0.5 to 9.99	0.01
10.0 to 99.9	0.1
100 to 750	1.0

When the battery strength indicator shows that the battery strength is low, replace the batteries. See [Replacing the Batteries](#) on page 33.

# Operating Modes

With the flow meter switched on, briefly press the Power/Mode button to scroll through the different operational modes.



The available modes are as follows:

## Volumetric flow mode

This is the default mode on power up. In this mode, the volumetric flow rate is displayed in mL/min.

## Mass flow mode

In this mode, the volumetric flow rate is corrected taking into account the current atmospheric pressure and ambient temperature. The flow rate is displayed in sccm (standard cubic centimeters per minute) referenced to one atmosphere of pressure and 0 °C.

## Split mode

In this mode, you can store a flow measurement as a reference value, and then compare subsequent flow measurement values as a ratio of the current measurement to the reference measurement. This is useful when troubleshooting a GC Inlet.

## Info mode

**Info** mode provides details on the flow meter and the installed cartridge. In addition, **Info** mode allows you to set the display brightness and control the Auto off functionality.

### To access Info mode:

- 1 With the unit switched on, repeatedly press the Power/Mode button until **Info** mode is displayed.
- 2 Once in **Info** mode, pressing the Enter/Clear/Toggle button scrolls through the available screens.

### Display brightness

Display brightness can be set to high or low.

### To change the display brightness setting:

- 1 With **Info** mode displayed, briefly press and release the Enter/Clear/Toggle button to cycle through available screens until the **Brightness** screen is displayed.
- 2 Press and hold the Enter/Clear/Toggle button for two seconds to toggle between **High** and **Low** options. The screen brightness changes based on the selected option.



## ADM Flow Meter

### Info mode

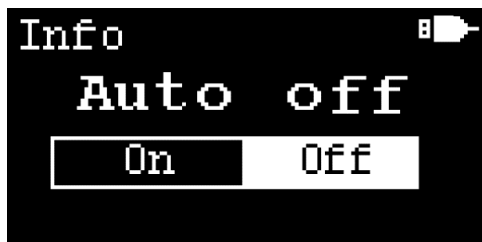
#### Auto off

In battery power mode, the unit defaults to "auto off" when the power is on. This means that every time the unit is activated, a "power-off" cycle begins, lasting for 10 minutes. The flow meter will operate continuously until it is manually turned off.

In USB power mode, the **Auto off** function is always off and the option to change the **Auto off** setting is disabled.

#### To change the Auto off setting:

- 1 With **Info** mode displayed, briefly press and release the Enter/Clear/Toggle button to cycle through available screens until the **Auto off** screen is displayed.
- 2 Press and hold the Enter/Clear/Toggle button for two seconds to toggle between **On** and **Off** options. The **Auto off** function changes based on the selected option.



## ADM Flow Meter

### Info mode

#### Errors/Warnings

With **Info** mode displayed, briefly press and release the Enter/Clear/Toggle button to cycle through available screens until the **Error/Warning** screen is displayed.



**Table 2** Error and warning code descriptions

Error/ Warning Code	Type	Description	Troubleshooting
01 No Cal Info	Error	No calibration information	Contact Agilent Technical Support
02 No Verif	Error	Flow meter is not verified	Contact Agilent Technical Support
03 PresTemp Err	Error	Pressure/temperature sensor failure	Contact Agilent Technical Support
04 No Cart	Error	No cartridge detected	Install a valid cartridge.
05 No MF Info	Warning	No mainframe information	Contact Agilent Technical Support
06 Auto Recover	Warning	Auto-recovery mode	Reboot the flow meter



**Table 2 Error and warning code descriptions (continued)**

Error/ Warning Code	Type	Description	Troubleshooting
07 Overflow	Warning	Measurement exceeds instrument range	Measure gas flow within the acceptable flow range
08 Cart Exp	Warning	Cartridge expired	Install a new cartridge
09 Low RTC Bat	Warning	RTC (real time clock) backup battery low	Contact Agilent Technical Support
10 Op Temp	Error	Out of operating temperature range condition (0 to 45 °C)	Operate the flow meter within the acceptable temperature range
11 Op Pres	Error	Out of operating atmospheric pressure range	Operate the flow meter within the acceptable atmospheric pressure range
12 Ver Mismatch	Error	Firmware version mismatch with cartridge version	Upgrade firmware to latest version
13 Invalid Cart	Error	Unable to identify cartridge types	Contact Agilent Technical Support

## ADM Flow Meter

### Info mode

#### Cartridge information

With **Info** mode displayed, briefly press and release the Enter/Clear/Toggle button to cycle through available screens until the **Cartridge** screen is displayed. There are two pages in **Info** mode to display cartridge information.

The first **Cartridge** screen displays the date information about the currently installed cartridge. This includes the date that the cartridge was first used (Activation date), and the date the cartridge is due to be replaced (Due date). In addition, there is a rectangular bar as a graphic representation of the remaining life of the installed cartridge.



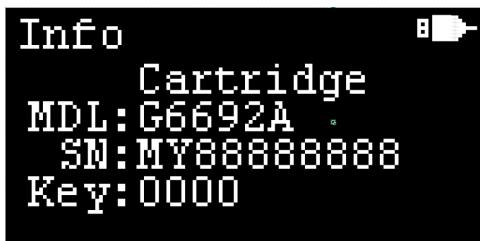
When the cartridge is expired, the rectangular bar is fully filled and **Expired!** is blinking in the rectangular bar to alert user.



## ADM Flow Meter

### Info mode

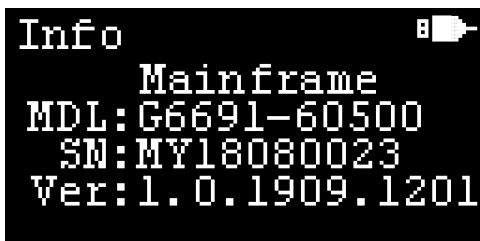
The second **Cartridge** screen displays information about the currently installed cartridge. This includes the cartridge model number (**MDL**), serial number (**SN**) and key number (**Key**). The key number is used to access the online copy of the cartridge's calibration certificate.



### Mainframe information

With **Info** mode displayed, briefly press and release the Enter/Clear/Toggle button to cycle through available screens until the Mainframe screen is displayed.

The **Mainframe** screen displays information about the mainframe. This includes mainframe model number (**MDL**), serial number (**SN**) and firmware version number (**Ver**).



# Making a Flow Measurement

#### CAUTION

Make sure that the flow to be measured is within the range of the flow meter. Flows exceeding 750 mL/min may damage the cartridge and void the warranty.

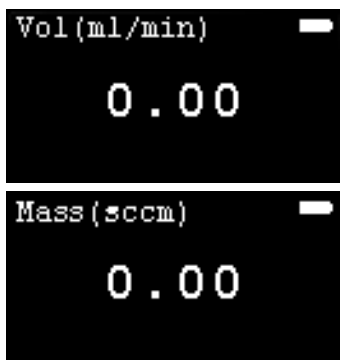
#### NOTE

Always turn the flow meter on before connecting it to a flow source.

- 1 When the unit is powered on, it defaults to volumetric flow mode. (If you want to use the mass flow mode, briefly press the Power/Mode button.)
- 2 Connect the flexible tubing to the gas source to be measured.
- 3 Wait for the reading to stabilize (1 to 2 seconds), then observe the reading.

#### NOTE

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

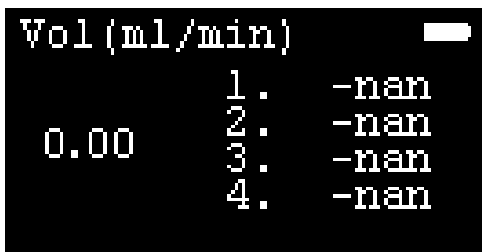


# Storing Flow Measurements

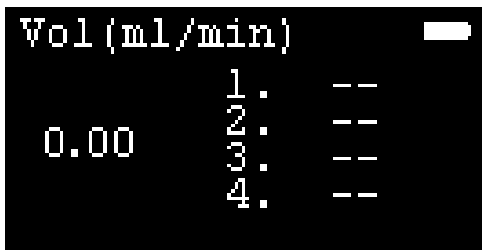
When in the volumetric flow mode or mass flow mode, up to four flow values can be stored on the screen for reference later.

**To store one or more values:**

- 1 With either volumetric flow mode or mass flow mode displayed, briefly press the Enter/Clear/Toggle button. The measurement storage screen appears. Any previously stored values are displayed on the screen. If the cartridge is unused, the values will be listed as nan (not a number).



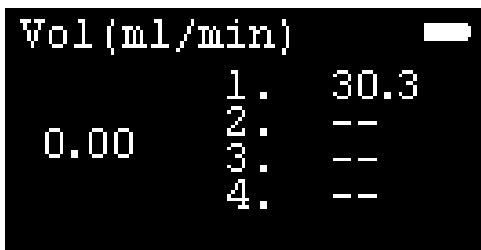
- 2 Press and hold the Enter/Clear/Toggle button to clear the previously stored values.



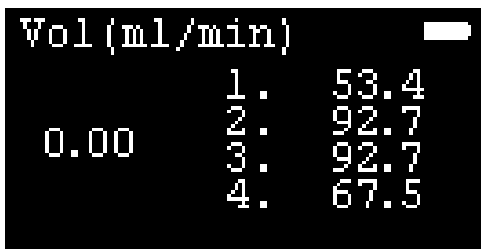
## ADM Flow Meter

### Storing Flow Measurements

- 3 Press the Enter/Clear/Toggle button to store a value to the first available slot.

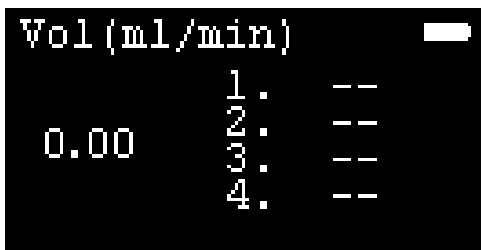


- 4 Repeat step 2 to store additional values to the subsequent slots. Up to four values can be stored.



#### To clear the stored values:

- Hold down the **Enter/Clear/Toggle button**. All of the stored values are cleared from memory.

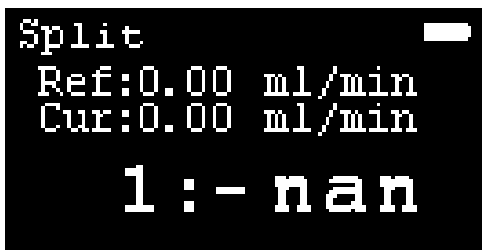


# Reading and Setting a Split Ratio

In **Split** mode, you can store a flow measurement as a reference value, and then compare subsequent flow measurement values as a ratio of the current measurement to the reference measurement. This is useful when verifying or troubleshooting the operation of a gas chromatograph Inlet.

#### To read and set a split ratio:

- 1 With the unit switched on, repeatedly press the Power/Mode button until **Split** mode is displayed.



#### NOTE

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

- 2 Turn off the detector gases.
- 3 Connect the flexible tubing to the GC column gas flow.
- 4 Wait for the reading to stabilize (1 to 2 seconds).
- 5 Briefly press the Enter/Clear/Toggle button. The current reading is stored as the reference value. The ratio value is displayed as 1:1.
- 6 Disconnect the flexible tubing from the GC column flow then connect it to the split vent or the gas flow that you want to compare. The display shows the ratio directly.

## ADM Flow Meter

### Reading and Setting a Split Ratio

- 7 Adjust for the desired ratio by adjusting the flow of the split vent, or the other reference flow, until the required ratio is displayed.



To clear the stored reference value, press the Enter/Clear/Toggle button.



# About Flow Measurements

When compared with readings from the ADM flow meter, measurements taken with bubble-type flow meters may show a difference. This does not indicate a problem with your flow meter. As a consequence of the ideal gas law, measurements made with both soap bubble meters and the flow meter are temperature sensitive. However, bubble-type flow meters 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 flow meter. 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 flow meter itself is warmed, the amount of water vapor increases, and the readings can be much higher than the true flow rate.

# USB Interface

Power can be supplied via the micro USB port located on the side of the unit.

**NOTE**

**Using the USB port to supply power does not recharge the installed batteries.**



The flow meter can communicate with a connected PC via the USB port. Data from the flow meter can be collected by connecting the USB port to your computer with the included USB cable. The flow meter USB driver will be needed for the instrument to communicate with your PC.

## ADM Flow Meter

### USB Interface

For details, please visit:

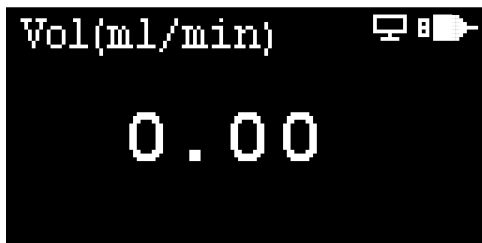
[www.agilent.com/en/product/gas-purification-gas-management/gas-management/adm-flow-meter](http://www.agilent.com/en/product/gas-purification-gas-management/gas-management/adm-flow-meter) to download the driver and view the Connecting your ADM flow meter to your PC instrument sheet.

#### NOTE

**When using the data acquisition capability of the ADM flow meter, you should disable the Auto off feature. See [Auto off](#) on page 15.**

When the flow meter is being powered via the USB port, the battery icon on the screen is replaced by a USB connector icon.

When the flow meter is connected to PC software, the buttons on the flow meter are disabled. This is indicated by an icon to the left of USB icon on the screen.

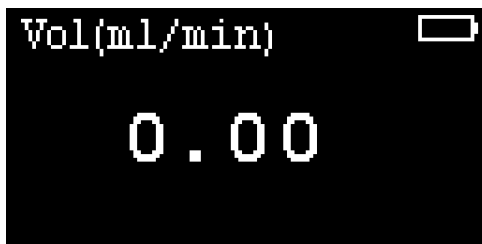


# Warning and Error Indications

Various warning and error indications are displayed on the screen as appropriate. Each is described below.

## Warning indication

A warning icon appears on the screen when the flow meter is being operated outside of acceptable conditions, when the filter is expired, when the RTC battery is low, and so on.



## Error indication

When a hardware fault occurs, an error icon is displayed on the screen. This example shows when a cartridge is not detected in the flow meter.



## ADM Flow Meter

### Low battery indication

## Low battery indication

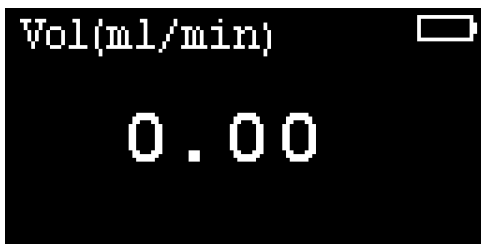
When the batteries need to be replaced, a low battery indication is displayed on the screen. When power is too low for operation, the flow meter will automatically shut down.



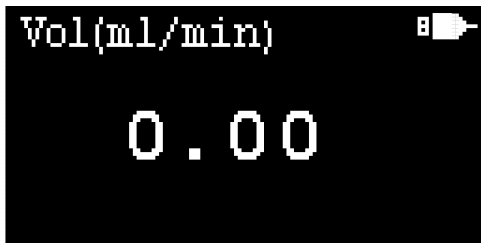
## Power Indications

The flow meter can be powered by batteries or through the USB port.

When powered by batteries, a battery icon will appear on the screen.



When powered through the USB port, a USB icon will appear on the screen.



# Installing and Replacing the Cartridge

## Installing the cartridge

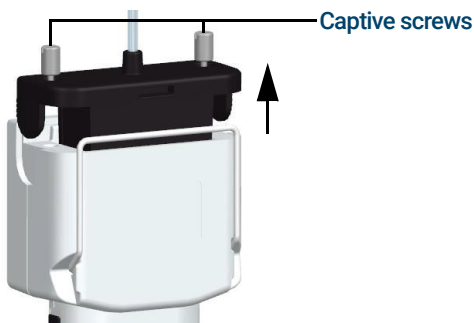
The CrossLab CS Mainframe is a platform that can accept the ADM Flow Meter Cartridge (part number G6692A) and Electronic Leak Detector Cartridge (part number G6694A).

**NOTE**

**If you purchased the leak detector cartridge standalone, update your existing mainframe to the latest firmware when using your leak detector for the first time.**

## Swapping or replacing the cartridge with ADM flow meter cartridge

- 1 Press and hold the Power/Mode button for three seconds to power down the unit.
- 2 Loosen both captive thumbscrews completely and lift the cartridge out of the CrossLab CS Mainframe body.



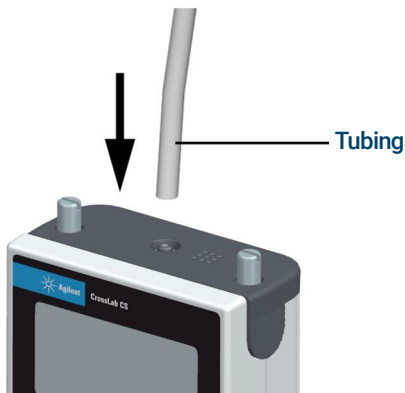
## ADM Flow Meter

### Swapping or replacing the cartridge with ADM flow meter cartridge

- 3 Insert cartridge of ADM flow meter in to the CrossLab CS Mainframe body. Hand tighten the two captive thumbscrews.



- 4 Install new flexible tubing.





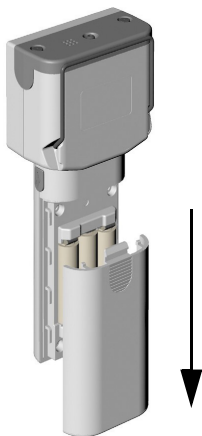
# Replacing the Batteries

**NOTE**

Recycle used batteries in accordance with all applicable governmental requirements for your location.

**To replace the batteries, do the following:**

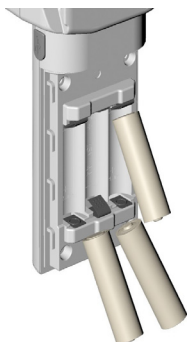
- 1 Press and hold the Power/Mode button for three seconds to power off the flow meter.
- 2 Remove the battery cover by pressing in on the grooved thumb pad on the rear of the flow meter and sliding the battery cover off.



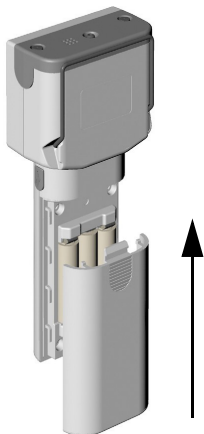
## ADM Flow Meter

### Replacing the Batteries

- 3 Remove and replace the three AA batteries.



- 4 Reinstall the battery cover. Position the battery cover over the batteries and slide onto the flow meter until it locks in place.



- 5 Briefly press the Power/Mode button to power on the flow meter.

## ADM Flow Meter

### Upgrading the Firmware/Retrieving Certificate of Calibration

# Upgrading the Firmware/Retrieving Certificate of Calibration

When a newer version of the flow meter firmware is available, you can upgrade to the latest version using your PC via the USB connection of the ADM flow meter.

Please visit <http://www.agilent.com/chem/ADMflowmeter> for instructions.

It is also possible to retrieve a digital copy of your cartridge's Certificate of Calibration in PDF form through the ADM flow meter's website.

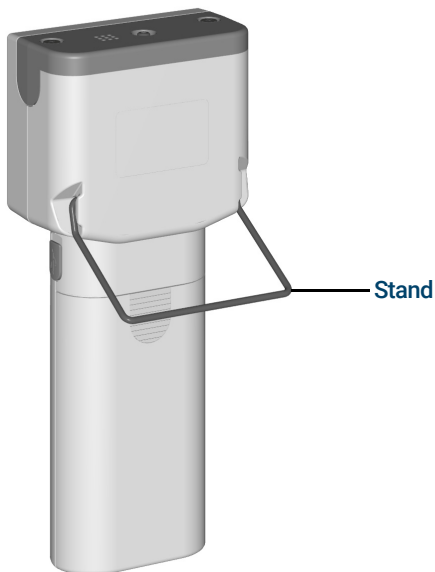
Please visit <http://www.agilent.com/chem/ADMflowmeter> for instructions.

## ADM Flow Meter

### Using the Flow Meter Stand

# Using the Flow Meter Stand

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



# A Note About Backpressure

The ADM cartridge is calibrated with the standard flexible tubing supplied with the meter at the time of purchase. Replacement tubes should be of equal internal diameter and length. Be aware that using tubing that increases or decreases the total volume of gas in the tubing will affect accuracy. Tubing of greater volume will result in slightly lower flow readings. This is because the transducer creates an ever-so-small backpressure that compresses the gas slightly.

## 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](http://www.agilent.com)).

## Other Features

- Automatic power off
- Split ratio mode with continuous split flow rate reading
- NIST traceable calibration
- Compatible with dry gases
- Volumetric and mass flow measurements
- USB communication
- Replaceable flow meter cartridge - individually computer calibrated

# Safety and Regulatory Certification

Conforms to the International Electrotechnical Commission (IEC) 61010-1 safety standard.

Conforms to the following regulations on Electromagnetic Compatibility (EMC) and Radio Frequency Interference (RFI):

- CISPR 11/EN 55011: Group 1, Class A
- IEC/EN 61326-1

This ISM device complies with Canadian ICES-001(A).  
Cet appareil ISM est conforme a la norme NMB-001(A)  
du Canada.

## Class A EMC certification

This equipment has been evaluated for its suitability for use in a commercial environment. When used in a domestic environment, there is a risk of radio interference.

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서가 정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다. ※ 사용자 안내문은 "업무용 방송통신기자재"에만 적용한.

Designed and manufactured under a quality system registered to ISO 9001.



## Disposal

Please consider the environment when disposing of the instrument and packaging materials. Please recycle all environmentally friendly waste. Please contact your local government agency or facility operator for the proper disposal of the instrument and batteries.

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