

Gas chromatographers must routinely measure gas flows (when setting up an instrument, developing a method, or trouble-shooting). Even though many GCs have electronic pressure control (EPC) for setting flow rates, a flowmeter is still an essential tool to verify EPC readings when troubleshooting. Additionally, older GCs do not have EPC, requiring that flows be set manually. There are a variety of flow measuring devices available for this, falling into one of two categories, volumetric (bubble) flowmeters and mass flowmeters.



Agilent® Intuvo GC System. With regular replacement, sample contamination never reaches the head of the Agilent® Intuvo GC column - eliminating the need for column trimming.

### Item List

Description	Cat.No.
Guard chip, Intuvo, split/splitless inlet, 2/pk	28344INT
Jumper Chip, Intuvo, split/splitless inlet	28346INT
Guard chip, Intuvo, multimode inlet, 2/pk	28347INT
Jumper Chip, Intuvo, multimode inlet	28349INT

Intuvo Jumper chips provide a short, direct flow path for ultra-clean applications where a guard may not be needed. However, most applications will utilize Guard Chips to ensure column longevity. For more information visit: [SigmaAldrich.com/intuvo](http://SigmaAldrich.com/intuvo)

## Guard Chips/Jumper Chips for Agilent® Intuvo GC system

Guard chips eliminate the need for column trimming, saving time and improving sample throughput with the

# Flowmeters

## Optiflow Bubble Flowmeters

These volumetric (bubble) flowmeters are reliable, accurate and easy to use.

- Automates the 'positive displacement' technique, which works independently of the type, mass, or mixture of gas being measured
- Combines the simplicity and versatility of a bubble meter with the speed and accuracy of a microprocessor
- Optical sensors respond accurately to the passage of a bubble
- Features an easy to read, accurate digital display, eliminating the need for tedious bubble watching, timing and flow rate/time conversions
- Requires a 9 volt battery for operation



Description	Flow Range	Cat. No.
Model 520	0.5-500 mL/min.	28679-U

## Ellutia 7000 Digital Volumetric/Mass Flowmeter

This pocket-sized flowmeter has a large OLED display, which makes reading flows clear and easy. Unlike other flowmeters, the Ellutia 7000 can operate in either a volumetric or a mass mode. The built-in rechargeable battery means the user no longer has to worry about changing dead batteries.

- Mode: volumetric or mass measurements

- Split ratio mode: yes
- Gases: air, argon, argon/methane, carbon dioxide, helium, hydrogen, nitrogen, and oxygen
- Inlet pressure: 25 psi (175 kpa) maximum
- Inlet: 1/16" I.D. flexible tubing (included)
- Flow range: 0.1 to 500 mL/min (0.1 to 275 mL/min for carbon dioxide)
- Resolution: 0.1 mL/min
- Accuracy: ±2.5% of reading or ±0.4 mL/min (whichever is greater), able to dial in column I.D., temperature, and pressure values for added accuracy
- Display: OLED
- Calibration: 25-point, ISO 17025 traceability, recalibration service available
- Declaration of Conformity according to ISO/IEC Guide 22 and EN 45014
- Temperature: 15-35 °C
- Size: 68 x 130 x 30 mm
- Weight: 150 g
- Power: internal battery (automatic shutoff feature conserves battery), charge battery using a 110 VAC charger or a micro-USB cable
- CE mark: yes
- Data output: USB cable

Description	Pkg.	Cat. No.
Ellutia 7000 Digital Volumetric/Mass Flowmeter	1 ea.	29597-U

## Gas Delivery Flow Measurement



Supelco  
Rotameters

Designed for accurate metering, these rotameters are excellent for chromatographic purposes. Each rotameter consists of a flow tube and four interchangeable floats. Standard flow tables (mL/min at STP) are included. The rotameter is easy to mount on any chromatograph, or you can install it on the optional tripod assembly. Available with or without needle valves.

FLOW RANGE (ML/MIN)	ROTAMETER LENGTH (MM)	G	FLOAT CAPACITY (ML/MIN AIR, STP)		
			S	ST	C
0-33	65	6	8	17	33
0-110	150	19	30	61	110
0-246	150	49	73	137	246
0-454	150	92	140	264	454

<sup>1</sup> G = glass, S = sapphire, St = stainless steel, C = Carboly

### SPECIFICATIONS

Accuracy:	±2% full scale
Repeatability:	±0.25%
Max. Operating Pressure:	200psig (13.8 bar) / 14kg/cm <sup>2</sup>
Max. Operating Temp.:	250°F/121°C
Useful Flow Range:	10:1 minimum (one float)

Order Swagelok connectors separately.

FLOW RANGE	CAT. NO.	PRICE
<b>WITH NEEDLE VALVE</b>		
0-33mL/min	23324	
0-110mL/min	23325	
0-246mL/min	23320-U	
0-454mL/min	23326	
<b>WITHOUT NEEDLE VALVE</b>		
0-33mL/min	503843	
0-110mL/min	503851	
0-454mL/min	503886	

### Tripod Assembly

Cat. No. 23322 is for Supelco rotameters, Cat. Nos. 23320-U, 23324, 23325, 23326. Has leveling screws and a built-in level.

Cat. No. 22548 is for modular rotameters, Cat. Nos. 22549 and 22550-U.

DESCRIPTION	CAT. NO.	PRICE
for Supelco rotameters	23322	
for modular rotameters	22548	



Swagelok Connectors

Swagelok (A) to 1/8" NPT (B). Required for connecting all rotameters on this page to gas supply. Also available with 7µm frits – please inquire.

SWAGELOK NO.	SIZE	CAT. NO.	PRICE
<b>BRASS (PK. 2)</b>			
200-1-2	1/8" tube	22082	
400-1-2	1/4" tube	22083	
<b>STAINLESS STEEL (EACH)</b>			
200-1-2	1/8" tube	22084-U	
400-1-2	1/4" tube	22085-U	



Modular Rotameters

### Low Flow Modular Rotameter Kit

Module 1:	glass float (6-60mL/min) stainless steel float (15-150mL/min)
Module 2:	sapphire float (11-110mL/min) Carboly float (30-300mL/min)

### High Flow Modular Rotameter Kit

Module 1:	glass float (38-380mL/min) stainless steel float (84-840mL/min)
Module 2:	sapphire float (54-540mL/min) Carboly float (125-1250mL/min)

For rapid float changes. Modular assembly enables you to quickly change floats to monitor different flow rates. You never touch the float – simply interchange the entire tube/float module. Each kit contains two modules, with two floats to each module.

Readings are accurate to within ±2%. Conversion charts for air, Ar, CO<sub>2</sub>, He, H<sub>2</sub>, N<sub>2</sub>, and O<sub>2</sub> are included. Order the tripod assembly (Cat. No. 22548) and Swagelok connectors separately.

DESCRIPTION	CAT. NO.	PRICE
Low Flow Rotameter Kit (6-300mL/min)	22549	
High Flow Rotameter Kit (38-1250mL/min)	22550-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas  
Chromatography

## Gas Delivery Flow Measurement

### Aalborg Low-Cost Mass Flowmeters

- $\pm 1.5\%$  accuracy, full scale, over ranges from 0-50mL/min to 0-10L/min
- Aluminum body for noncorrosive gases
- Tiltable display
- AC or rechargeable battery operation
- EN 55011 Class I, Class B; EN50082-1

Use these economical instruments to read gas mass flow rate for common GC gases –  $^2\text{HHe}$ ,  $\text{N}_2$ ,  $\text{CO}_2$ , air, and argon/methane mixtures – at inlet pressures up to 500psig. Each unit features a tiltable (more than  $90^\circ$ ), LCD digital readout built into the top of the transducer. The readout module can easily be removed for remote readings.

The units can be powered with rechargeable batteries or with 110VAC or 220VAC current – choose the option you need.

**Principal of Operation** - The stream of metered gas is split proportionally. A small part of the flow is shunted through a straight capillary sensor tube, the balance of the gas flows through a laminar flow conduit. Heat flux is introduced at two sections of the capillary sensor tube by means of precision wound coils. As it flows, the gas carries heat from the coils upstream to the coils downstream. The resultant temperature differential is proportional to the change in resistance of the coils. Wheatstone bridges are used to monitor the instantaneous temperature of each of the coils. The closed loop control circuit detects and amplifies the temperature gradient and restores the temperature balance of the coils. The current required at any given time to maintain dynamic equilibrium is a function of the amount of heat carried by the gasses. An output signal of 0-5VDC or 4-20mA is generated, which indicates the mass molecular-based flow rate of the metered gas. Flow rates are unaffected by temperature or pressure variations within stated limits.



#### SPECIFICATIONS

Accuracy:	$\pm 1.5\%$ , full scale
Repeatability:	$\pm 0.5\%$ , full scale
Max. Pressure Drop:	up to 10 std. L/min
Gas Pressures:	500psig (34.5 bar) maximum 20psig (1.4 bar) optimum
Gas & Ambient Temp.:	32°F to 122°F (0 to 50°C)
Helium Leak Rate:	$1 \times 10^{-7}$ SCCS
Transducer Input:	+12VDC; 200mA
Fittings:	1/4" NPT (other fittings available on request)

#### RELATED INFORMATION

Note: These flowmeters can be used with all common GC gases, but they are calibrated for helium. Refer to the manual for conversion factors for other gases. For calibration for other gases, please inquire. (Price will be the same.)

DESCRIPTION	CAT. NO.	PRICE
0-50mL/min	503894	
0-100mL/min	503908	
0-200mL/min	503916	
0-500mL/min	503924	
0-1L/min	503932	
0-5L/min	503940	
0-10L/min	503959	
Power Sources (one needed for each unit)		
Battery Kit with Charger, 110VAC	503266	
Battery Kit with Charger, 220VAC	503274	
Power Supply, 110VAC, 12VDC	503282	
Power Supply, 220VAC, 12VDC	503290	

<sup>1</sup> CE approved.

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## Gas Delivery Flow Measurement



### Bubble Flowmeters

Use these bubble flowmeters to check splitter or detector flow, or to calibrate personal pumps for accurate air sampling. Bubble meters are graduated in these increments: 10mL by 1mL; 25mL by 5mL; 50mL by 10mL; 100mL by 20mL; 500mL by 50mL; and the 1000mL by 100mL. The 500mL and 1000mL meters can be used to measure positive or negative flow.

Bubble meter kits include a squeeze bulb, 30" (3/4m) of 5/16" Tygon tubing, a collapsible stand, and a bottle of liquid soap solution.

DESCRIPTION	CAT. NO.	PRICE
<b>BUBBLE METER KITS</b>		
500mL Bubble Meter Kit	20414	
1000mL Bubble Meter Kit	20415	
<b>BUBBLE METERS AND ACCESSORIES</b>		
10mL Bubble Meter <sup>1</sup>	20562	
25mL Bubble Meter <sup>1</sup>	20431	
50mL Bubble Meter <sup>1</sup>	20432	
100mL Bubble Meter <sup>1</sup>	20433-U	
Replacement Magnetic Clamps for 10mL, 25mL, 50mL units (pk. of 6)	20595	
Replacement Squeeze Bulbs (pk. of 10)	23166	
500mL Bubble Meter	20427-U	
1000mL Bubble Meter	20428-U	
Snoop, 8 oz/475mL bottle	20434	

<sup>1</sup> Includes 2 magnetic clamps.

### Capillary Column Bubble Meter

Accurately measure capillary column gas flow rate. This 0.5mL volume bubble meter will allow you to calculate true split ratio by measuring actual flow rate – even as small as 0.01mL/min. Graduated in 0.01mL increments.

Choice of easy installation setups: magnetic clamps or stand.

DESCRIPTION	CAT. NO.	PRICE
with stand	23771	
with magnetic clamps	23762-U	

### Humonics Veri-Flow 500 Electronic Flowmeter



- Calibrated for nitrogen, helium, hydrogen, air, 5% argon/methane (certificate supplied)
- Range of 5-500mL/min; accurate to within  $\pm 2\%$  of reading or 0.25mL (whichever value is larger)
- Continuous readings in volume, linear velocity, or split ratio
- EPC compatible
- 9-pin RS 232 communication port for recording data
- Includes power adapter jack and recharger
- Only 4 x 5 x 3" (10 x 12.5 x 7.5cm)

The leaders in GC flow measurement technology have developed an outstanding instrument for analysts who want a simple, continuous-reading flowmeter for general GC applications.

The Veri-Flow 500 Electronic Flowmeter is multiple-point calibrated to NIST-certified volumetric standards for nitrogen, helium, hydrogen, air, and 5% argon/methane, for superior accuracy and to help you comply with ISO 9000, GLP, and other stringent quality control protocols. The display indicates flow in volume (mL/minute) or linear velocity (cm/second), or split ratio. Operation is pulse-free, unaffected by temperature or pressure changes, and the unit is fully compatible with electronic pressure control systems. Operates on internal rechargeable batteries. Very low power consumption and automatic shut-off.

DESCRIPTION	CAT. NO.	PRICE
110VAC <sup>1</sup>	23143	
110-220VAC, 50/60Hz <sup>2</sup>	23142	

<sup>1</sup> CE approved

<sup>2</sup> Includes 110VAC USA, 220VAC European power cords and a universal charger



### Digital Timers

**LCD Digital Stopwatch** Performs many functions: time of day, 1/100 second timing, split (lap) times, day, date and month, time in/time out, two finishing times, night light, 0.003% accuracy. Includes battery.

**Digital Timer/Clock** Countdown timer and stopwatch functions counts up or down from one second to 24 hours. Alarm sounds for 60 seconds and shuts off automatically. Unit clips onto your pocket. Includes a 1.5V battery.

DESCRIPTION	CAT. NO.	PRICE
LCD Digital Stopwatch	23011	
Digital Timer/Clock	22754-U	

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Gas  
Chromatography

SUPELCO

## Gas Delivery

### Flow Measurement, Leak Detectors



#### Humonics Optiflow Flowmeters

- Four flow ranges available; accurate to within  $\pm 2$  or  $\pm 3\%$  of any reading
- Portable – includes standard 9-volt battery
- Automatic power-off for extended battery life
- Field replaceable tubes
- Compatible with electronic pressure control

#### SPECIFICATIONS

Optiflow 420 Digital Flowmeter  
Flow Range: 0.5-50mL/min  
Accuracy:  $\pm 3\%$  of any reading  
Display: mL/min or linear velocity

Optiflow 570 Digital Flowmeter  
Flow Range: 0.5-700mL/min  
Accuracy:  $\pm 2\%$  of any reading  
Display: mL/min or split ratio

Optiflow 650 Digital Flowmeter  
Flow Range: 5-5000mL/min  
Accuracy:  $\pm 2\%$  of any reading  
Display: mL/min or split ratio

These high-precision instruments combine the simplicity and versatility of a bubble meter with the speed and accuracy of a microprocessor, providing you with a reliable means of measuring gas flow. Optiflow Digital Flowmeters automate the performance-proven bubble flowmeter "positive displacement" technique that works independent of the type, mass, or mixture of gases. They retain the key advantages of the bubble meter – simplicity and reliability – while improving accuracy and reproducibility, and providing certified performance.

The versatile units can be used with gases. And they feature an easy-to-read, accurate digital display, eliminating the need for tedious bubble watching, timing, and flow rate/time conversions. The bubble is visible for your observation.

Optiflow Digital Flowmeters help you comply with the quality protocols of the American Society for Quality Control, ISO 9000, and Good Laboratory Practice. Each unit is individually calibrated to the registered standards of the National Institute of Standards and Technology and comes with a certificate of calibration. A recalibration service is available.

DESCRIPTION	CAT. NO.	PRICE
Optiflow 420 Digital Flow Meter	22806	
Replacement Flow Tube	22779-U	
Optiflow 570 Digital Flow Meter	22741-U	
Replacement Flow Tube	22777	
Optiflow 650 Digital Flow Meter	22912	
Replacement Flow Tube	22778	

#### Humonics Liquid Flowmeters

- Easy set-up operation
- NIST traceable

Humonics digital liquid flowmeters replace the tedious and time-consuming glass burette and stopwatch traditionally used to measure flow rates – a microcomputer and infrared optics are used to track a rising volume of liquid within a tube of precision-bore glass. Absolute accuracy is established by comparing the performance of the instrument to an NIST-registered burette.

MODEL	FLOW RANGE (mL/min)	RESOLUTION	CALIBRATION POINTS
1000	0.100 - 1.999	0.001	1.5, 3, 5mL/min
	2.00 - 9.99	0.001	
	10.0 - 30.0	0.1	

DESCRIPTION	CAT. NO.	PRICE
Model 1000 Liquid Flowmeter, 110VAC	55090-U	
Model 1000 Liquid Flowmeter, 220VAC <sup>1</sup>	55093	

<sup>1</sup> CE approved



#### Snoop Liquid Leak Detector

Also useful in bubble meters.

DESCRIPTION	CAT. NO.	PRICE
Snoop, 8 oz./475mL bottle	20434	
Snoop, 1 gallon/3.8L bottle	20640-U	

#### Leak-Tec Leak Detector

Will not bubble on a heated part unless there is a leak. Use at temperatures up to 210°C.

DESCRIPTION	CAT. NO.	PRICE
Leak-Tec Leak Detector, 283g pressurized can	20566	

NOTE: We do not recommend using liquid leak detectors with capillary GC systems.

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