



## Operating Instructions

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### Soap Film Flowmeter Cat. No. 311-1000

#### Assembly

Screw the tripod legs into the base ring. Insert the bulb end of the flowmeter into the center hole of the base ring and slide the glass down into the ring until the zero line is approximately 1 1/2 inches above the base ring. Tighten the screws until the O-ring is compressed snugly against the glass.

#### Preparation

Tip the flowmeter at an angle and pour a small amount of film solution into the top of the glass tube so that the liquid runs down the sides. Squeeze the rubber bulb occasionally to release trapped air and continue adding film solution until the liquid fills the bulb and rises to a level just below the side arm inlet.

*To calibrate a sample pump*, connect the pump, with the sampling media in line if applicable, to the appropriate end of the flowmeter. If the pump **draws** air, connect it to the rubber tubing attached to the rubber stopper (see Figure 1 on reverse side). If the pump **blows** air, connect it to the lower side arm of the flowmeter using rubber tubing. The 311 Laboratory Film Flowmeter Kit is calibrated to a primary standard  $\pm 2\%$  of the volumes marked on the flowmeter.

#### Operation

Turn on the pump. Gently squeeze the rubber bulb to bring the liquid level momentarily above the sidearm inlet. Bubbles (soap film) will form which travel up the glass tube with the air flow. Repeat until the bubbles travel the length of the tube without breaking.

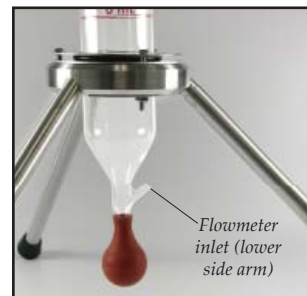
**CAUTION: Do not squeeze the bulb for more than an instant. Vigorous squeezing may form a froth which makes timing bubbles difficult and may cause film solution to be drawn into the pump.**

Use a precision stopwatch to time a single film as it travels between the volume lines marked on the glass. Start the stopwatch when the film reaches the zero line and stop the stopwatch when the film reaches the volume line. (It is usually best to form several bubbles 5 to 6 seconds apart and time the last bubble.) Record the time. Repeat the procedure at least three times ending at the same volume line and average the results.

#### Determining the Flow

Calculate the flow using the equation:

$$\text{Flow (ml/min)} = \frac{60}{\text{Time (sec)}} \times (\text{Volume line used (ml)})$$



Close up of 311 Flowmeter  
side arm (inlet)

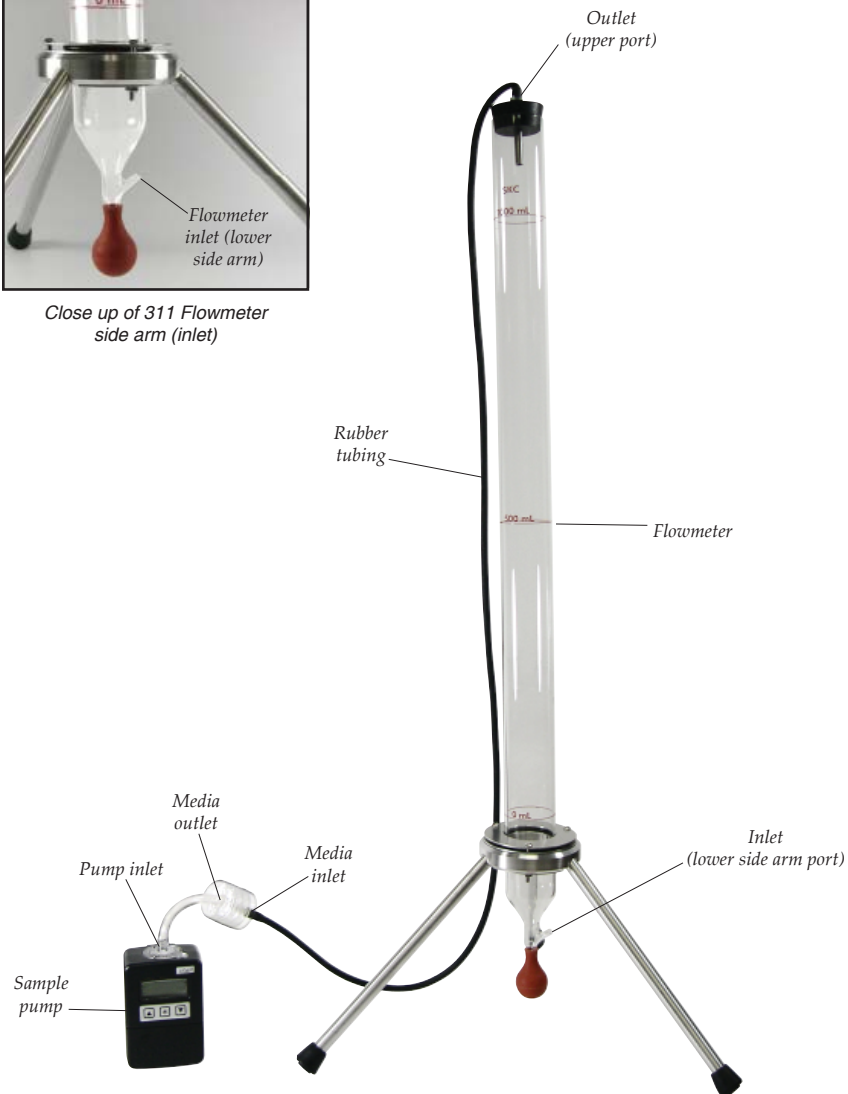


Figure 1.  
311 Series Flowmeter in calibration train with vacuum pump

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