

WP N°02: Flow Measurement (Rotameters)1. Objective

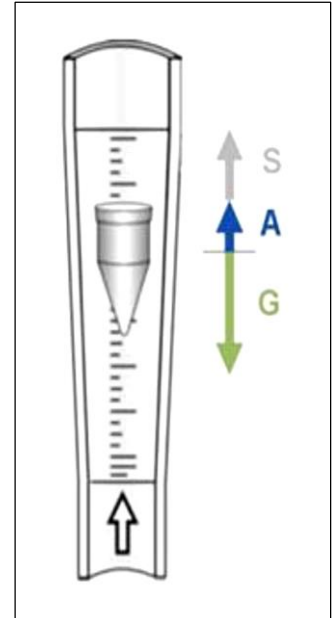
The objective of this practical work is to determine the flow rate using a variable area flowmeter (float type).

2. Measurement Principle

Variable area flowmeters, or float rotameters, consist of a vertical tapered measuring tube, wider at the top. A specially shaped float moves freely up and down within this tube.

Three primary forces act upon the float:

- ✓ **Buoyancy (A):** This depends on the fluid density and the volume of the float (which is constant at a constant density).
- ✓ **Weight (G):** This depends on the mass of the float. Floats can be made of materials such as stainless steel, aluminum, titanium, or hard rubber.
- ✓ **Flow Force (S):** Changes in flow volume force the flow transitorily, altering the flow rate until a new state of equilibrium is reached.

3. Equipment Description

Different measurement ranges are achieved by varying the nominal width of the cones (e.g., DN 15, DN 25).

The following factors influence the measurement:

- Cone shape (taper, length, etc.).
- Float shape (drag resistance).
- Float materials (mass).

Each flow value corresponds to a specific annular space resulting from the tapered shape of the tube and the specific position of the float. With glass cones, the flow rate is read directly from a scale at the float's reading line. For metal cones, the float position is transmitted to an indicator via a magnetic coupling.

4. Experimental Setup & Procedure**Equipment:**

- FME36 unit.
- Hydraulic bench.
- Graduated cylinder (test tube).
- Stopwatch.



Procedure:

1. Connect the hydraulic bench to the apparatus and turn it on.
2. Vary the flow rate by increments of 5 l/min.
3. Record the flow rate measurements provided by the variable area float.
4. Note the volume collected in the graduated cylinder and measure the time required to collect it.
5. Turn off the hydraulic bench.

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5. Results

Trial	Volume (l)	Time (s)	Flow rate (Flowmeter)	Flow rate (Graduated Cylinder)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

6. Required Tasks

1. Plot the real flow rate versus the flow rate measured by the variable area meter.
2. **Discussion:** Why are these values different? (*Space for commentary and interpretation of results*)

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