

Mechanics of a Variable Area Flowmeter

A variable area flowmeter (Figure 1) is a device used for measuring the flow of gases or gas mixtures. Typically, it consists of a glass metering tube (1) which is internally tapered such that the inside diameter at the bottom of the tube is smaller than that at the top. A float or floats (2) placed inside the tube are contained by float stops (3) inserted into the inlet and outlet of the tube. The tube assembly is fitted between the two end blocks (6 & 7) and sealed by packing gaskets (4). The flowmeter assembly is held together by front, back and side plates (10, 11 & 12). Once assembled, the flowmeter tube is tightened against the packing gaskets via a seal spindle (5) to ensure leak free operation. Flowmeters may also be equipped with a metering valve (13) which adds the capability of controlling flow rate.

As gas enters the flowmeter tube, the float is lifted from the zero position at the bottom of the tube. The float (Figure 2) rises to a point where the area surrounding the float is sufficient to allow unrestricted flow of gas. The greater the flow of gas, the higher the float will rise.

By knowing the variables involved (service gas, pressure, temperature, weight of float, tube diameter, etc.), the height of the float can be directly correlated to the flow of gas with relatively good accuracy. Generally, the tube is inscribed with a scale allowing the user to read the float position. The scale may be direct reading in flow units such as standard liters per minute (slpm) or standard cubic feet per hour (scfh). It may also be in a linear measurement such as millimeters (mm) which would require a calibration chart for cross referencing the linear measurement to a corresponding flowrate.

The accuracy of a variable area flowmeter is contingent on both its operating pressure and temperature. Gases at higher pressures will be compressed, and therefore a greater volume of gas will pass through the same given area. Similarly, gases at higher temperatures will be less dense, and less gas will pass through a given area. Therefore, all variable area flowmeters are calibrated at specific temperature and pressure conditions—generally at normal temperature (70°F) and pressure (14.7 psia).

1. Metering Tube Assembly
2. Float
3. Float Stops
4. Packing Gaskets & Grommets
5. Seal Spindle & O-Rings
6. End Block (Outlet)
7. End Block (Inlet)
8. Inlet & Outlet Adaptors
9. Adaptor O-Rings
10. Front Plate
11. Back Plate
12. Side Plates
13. Metering Valve Assembly

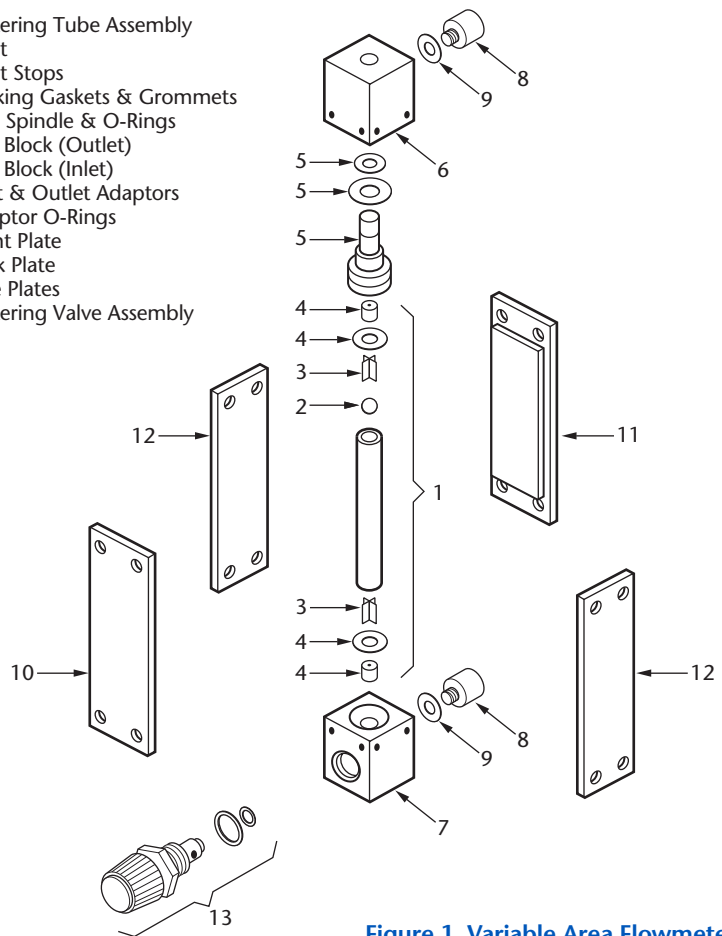


Figure 1, Variable Area Flowmeter