

VARIABLE AREA FLOW-METER

[FDI - VAFM - 209]

INTRODUCTION

A rotameter is a flow meter that measures the volumetric flow of liquids and gases. There is no difference between a rotameter and a flow meter, and these terms are interchangeable. Inside a flow meter, a gas or liquid moves a float until it reaches equilibrium - the technique to measure the flow rate. A user can easily read the gas or liquid flow rate from either a scale or digital meter next to the tube or a scale on the tube. Variable area flow meter applications extend across industries because it was and still is an economical way of measuring very low to high flow rates.

The rotameter is the most widely used variable area flowmeter because of its low cost, simplicity, low pressure drop, relatively wide rangeability, and linear output. Its operation is simple: in order to pass through the tapered tube, the fluid flow raises the float. The greater the flow, the higher the float is lifted. In liquid service, the float rises due to a combination of the buoyancy of the liquid and the velocity head of the fluid. With gases, buoyancy is negligible, and the float responds mostly to the velocity head. In a rotameter the metering tube is mounted vertically, with the small end at the bottom. The fluid to be measured enters at the bottom of the tube, passes upward around the float, and exits the top. When no flow exists, the float rests at the bottom. When fluid enters, the metering float begins to rise.

The float moves up and down in proportion to the fluid flow rate and the annular area between the float and the tube wall. As the float rises, the size of the annular opening increases. As this area increases, the differential pressure across the float decreases. The float reaches a stable position when the upward force exerted by the flowing fluid equals the weight of the float. Every float position corresponds to a particular flowrate for a particular fluid's density and viscosity. For this reason, it is necessary to size the rotameter for each application. When sized correctly, the flow rate can be determined by matching the float position to a calibrated scale or digital meter on the outside of the rotameter. Many rotameters come with a built-in valve for adjusting flow manually.

Several shapes of float are available for various applications. One early design had slots, which caused the float to spin for stabilizing and centering purposes. Because this float rotated, the term rotameter was coined.

Rotameters are typically provided with calibration data and a direct reading scale for air or water (or both). To size a rotameter for other services, one must first convert the actual flow to a standard flow. For liquids, this standard flow is the water equivalent in gpm; for gases, the standard flow is the air flow equivalent in standard cubic feet per minute (scfm). Tables listing standard water equivalent gpm and/or air scfm values are provided by rotameter manufacturers. Manufacturers also often provide side rules, nomographs, or computer software for rotameter sizing.



INTRODUCTION

A variable area flow meter is a type of differential pressure flow meter. Variable area flow meters are simple and versatile devices that operate at a relatively constant pressure drop and provide flow measurement of liquids, gases, and steam. The variable area flow meter is popular for industrial flow indication because it has a linear scale, a relatively long measurement range, and low pressure drop – and they are quite simple to install and maintain.

The variable area flow meter's operation is based on the variable area principle: fluid flow raises a float in a tapered tube, increasing the area for passage of the fluid. The greater the flow, the higher the float is raised. The height of the float is directly proportional to the flow rate. With liquids, the float is raised by a combination of the buoyancy of the liquid and the velocity head of the fluid. With gas flow, buoyancy is negligible, and the float responds to the velocity head alone.

A wide choice of materials is available for floats, packing, O-rings, and end fittings. Rotameter tubes for such safe applications as air or water can be made of glass, whereas, if breakage would create an unsafe condition, they are provided with metal tubes. Glass tubes are most common being precision formed of safety shielded borosilicate glass. Floats typically are machined from glass, plastic, metal, or stainless steel for corrosion resistance. End fittings are available in metal or plastic.

Floats have a sharp edge at the point where the reading should be observed on the tube-mounted digital Indicator. For improved reading accuracy, a glass-tube rotameter should be installed at eye level. This is because a direct reading device is accurate for only one specific gas or liquid at a particular temperature and pressure. A correlation flow meter can be used with a wide variety of fluids and gases under various conditions. In the same tube, different flow rates can be handled by using different floats.

Working Principle

The variable area flow meter's operation is based on the variable area principle: fluid flow raises a float in a tapered tube, increasing the area for passage of the fluid. The greater the flow, the higher the float is raised. The height of the float is directly proportional to the flow rate.



Digital Meter

The inner float magnetic field is detected by the high sensitive magnetic field detection sensor, enable us to show the digital readout As such this flow-meter does not require any electrical connection, since it operates on battery. It has an inbuilt two wire transmitter provide 24 VDC and take 4-20 mA Signal.

Advantages

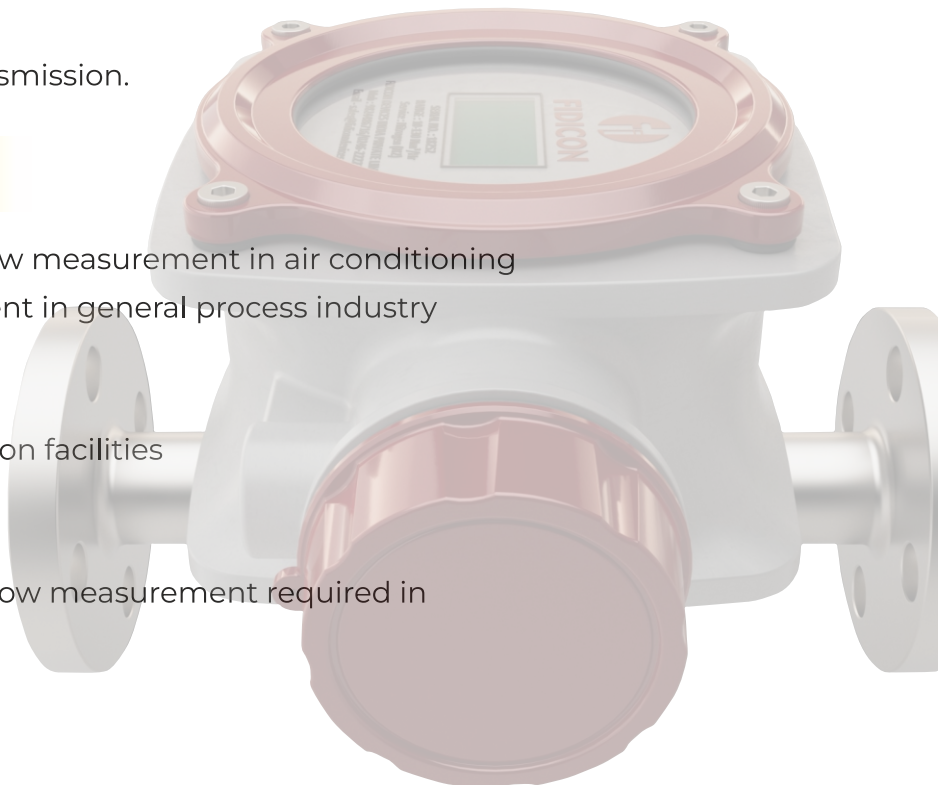
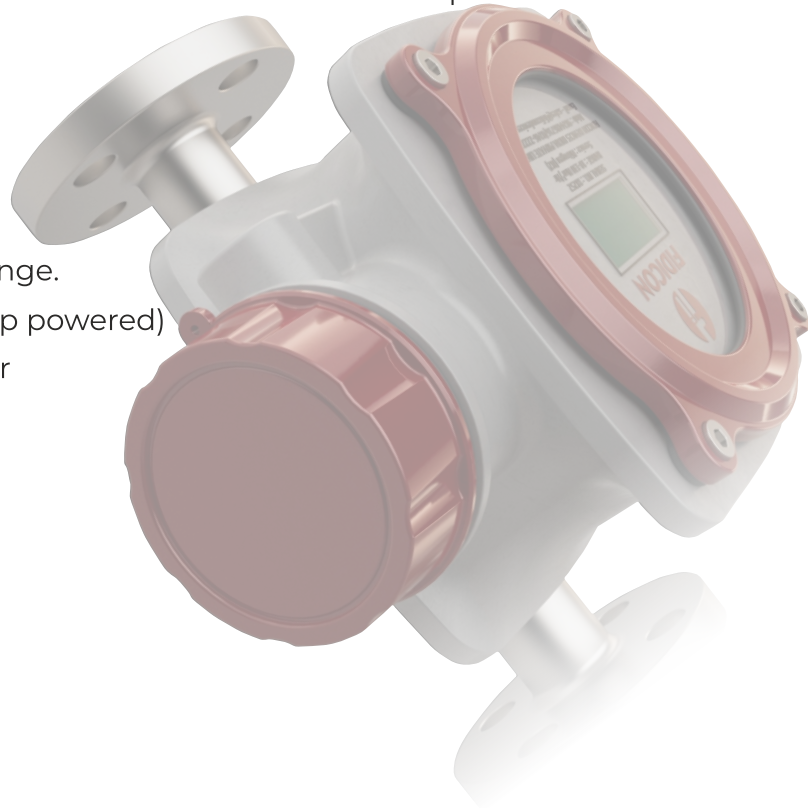
- It has wide range of application.
- It has a linear float response to flow rate change.
- Default inbuilt transmitter of 4 – 20 mA (Loop powered)
- Easy sizing or conversion from one particular services to another.
- Ease of installation and maintenance.
- Simplicity and low cost.
- Minimum pressure losses
- Easy visualisation of flow/ Easy to read

Disadvantages

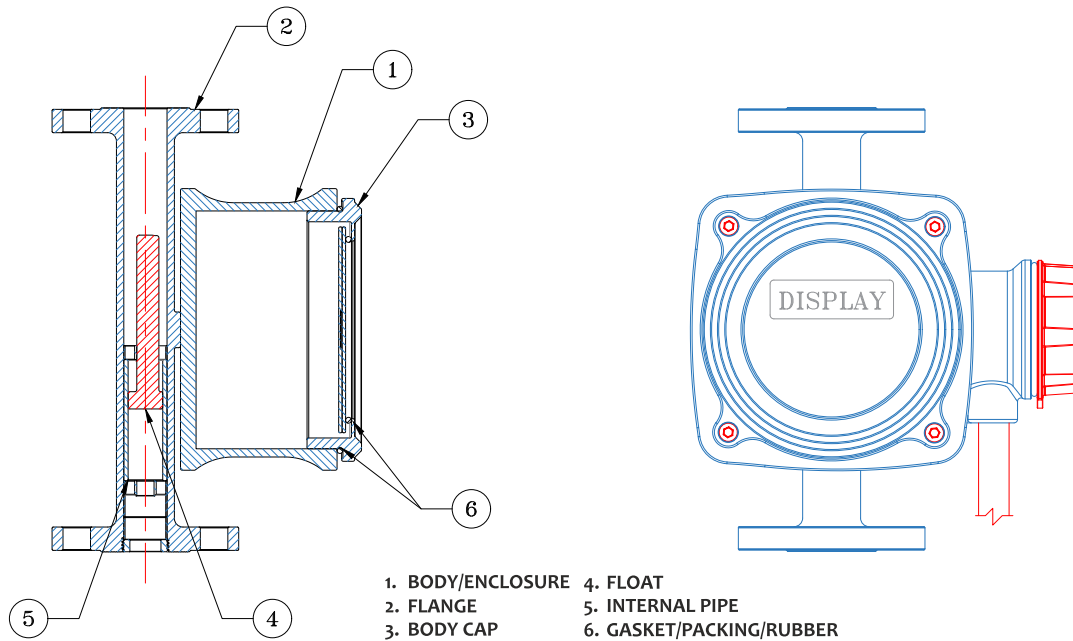
- It has limited accuracy.
- It is susceptibility to changes in temperature, density and viscosity.
- Fluid medium must be clean, no solids content.
- Erosion of devices(wear and tear).
- It can be expensive for large diameters application.
- It operates in vertical position only.
- It requires accessories for data transmission.

Application

- Hot and cold water as well as air flow measurement in air conditioning
- Medium and large line measurement in general process industry
- Cooling water lines
- Water treatment process
- Pure and ultra-pure water production facilities
- Testing of fire fighting pumps
- Testing of blowers
- Many application where accurate flow measurement required in process & engineering industries.



VARIABLE AREA FLOW METER



Maximum Flow & Pressure Loss

Line Size NB	20°C water flow m ³ /hr	0°C 1 atm Air flow Nm ³ /hr	Approx. Pressure Loss mm WC
15	0.2 - 1.2	6 - 35	200 - 225
20	0.4 - 2.0	8 - 60	220 - 230
25	1 - 5	30 - 150	200 - 270
40	2.5 - 10	70 - 300	200 - 250
50	3.5 - 17	100 - 500	225 - 260
65	6 - 30	200 - 900	225 - 240
80	10 - 45	300 - 1200	225 - 260
100	20 - 100	600 - 3000	350 - 700
125	30 - 120	900 - 4000	300 - 850
150	30 - 150	900 - 4500	350 - 950

Technical Specification

Line Size	15NB TO 150NB
Connection	Threaded, Flanged (ANSI/ASA/ASME B16.5/PN/NPT)
Materials	SS 316, SS 304, PTFE, SS BUFFED, MS POWDER COATED, LM6 WEATHERPROOF IP-65, SS 316TI, HASTELLOY C, ALUMINIUM, RUBBER, NEOPRENE RUBBER, METALLIC SPIRAL WOUND, CAF, FEP and other as per customer requirement.
Range ability	10:1
Repeatability	+/- 0.25% of FSR
Accuracy	+/- 1.5% of FSR
Repeatability	Digital Indicator,
Flow Direction	Bottom to Top
Indication	Digital Flow Rate
Mounting Position	Vertical
Pressure Rating	80 kg/cm ²
Temperature Rating	-50 to 120°C
Transmission	2 Wire loop powered
Enclosure	Flameproof/Weatherproof

Recommended Disposal

- Give it back to us & we will take care of recycling & possible disposal.
- User can dis-assemble the product in multiple stage
- The above may be handed over (state pollution board), authorized re-cycler item-wise.





ENQUIRY SPECIFICATIONS:

- [1] Service Media Details.
- [2] Size/Connection
- [3] System Operating and Design Pressure.
- [4] System Operating and Design Temperature.
- [5] Material Specifications (Body, Internal)

RECOMMENDED SPARES

- [1] Protecting Glass
- [2] Float
- [3] Bush U-Seal
- [4] O-ring
- [5] Packing/Gasket

OTHER RANGE OF PRODUCTS

- [1] Flame Arrester
- [2] Breather Valve
- [3] Level Indicators
- [4] Rotameters
- [5] Emergency Relief Valve
- [6] Gauge Hatch
- [7] Strainers
- [8] Pressure Reducing Valve
- [9] Safety Relief Valve
- [10] Flowmeters
- [11] Level Switches
- [12] Pressure Reducing Station
- [13] Level Gauge, etc.



Any Query?

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