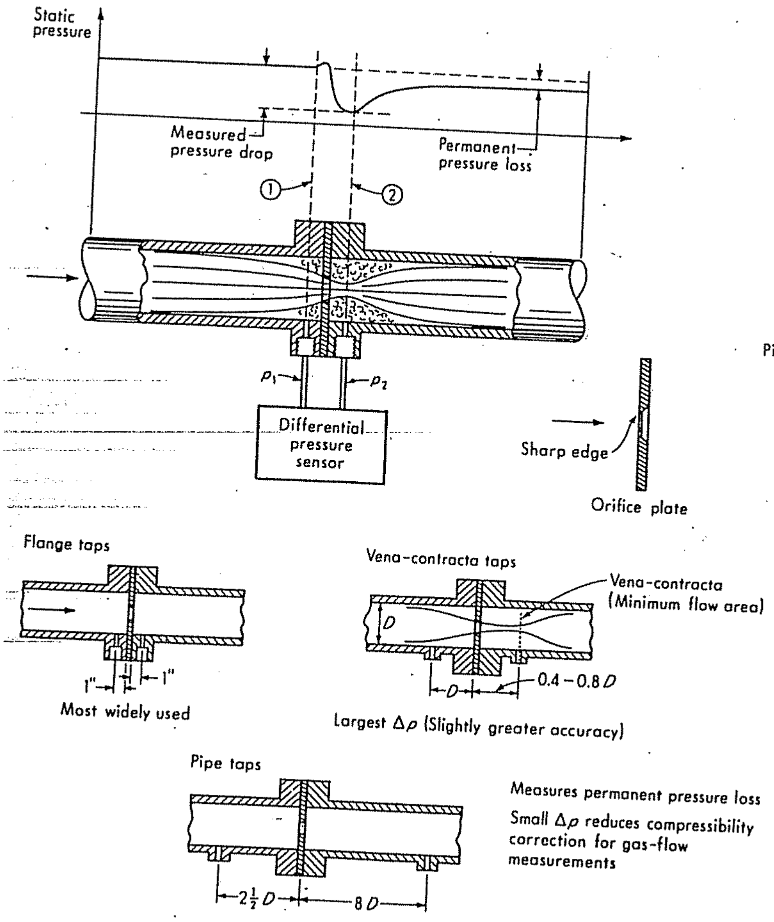


Figure 7.28 Orifice flowmetering.

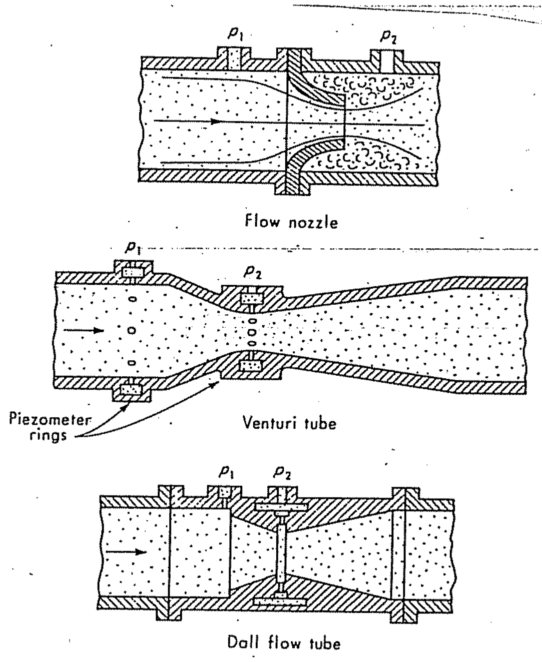


Figure 7.31 Variable-pressure drop flowmeters.

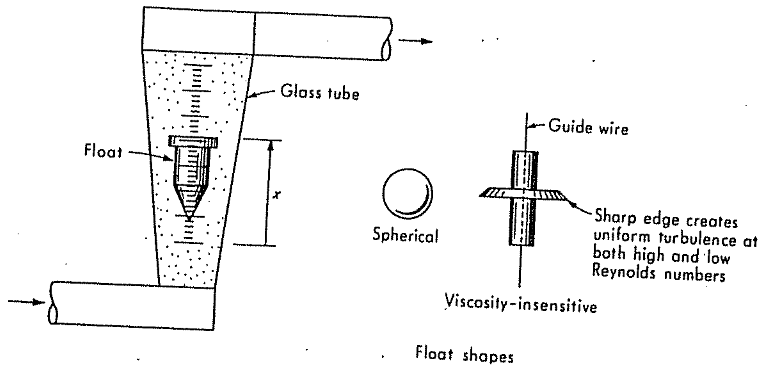


Figure 7.34 Rotameter.

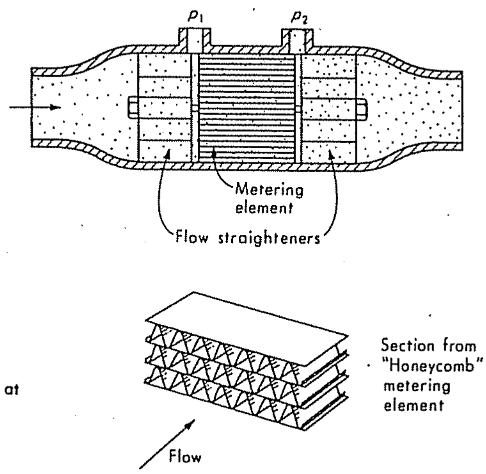


Figure 7.32 Laminar-flow element

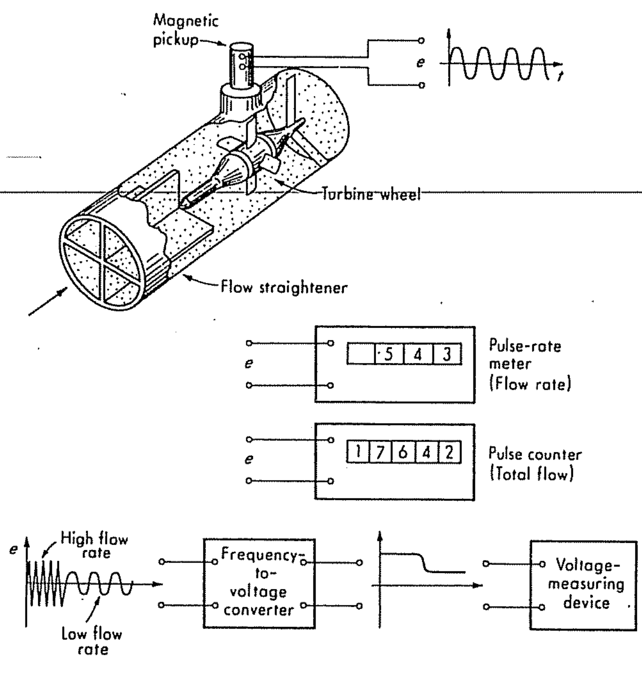


Figure 7.35 Turbine flowmeter.

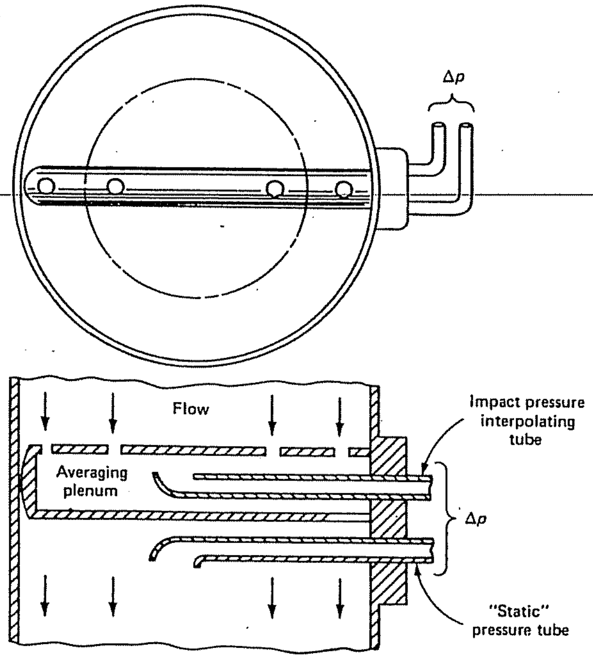


Figure 7.33 Averaging pitot tube.

Ultrasonic Flowmeters

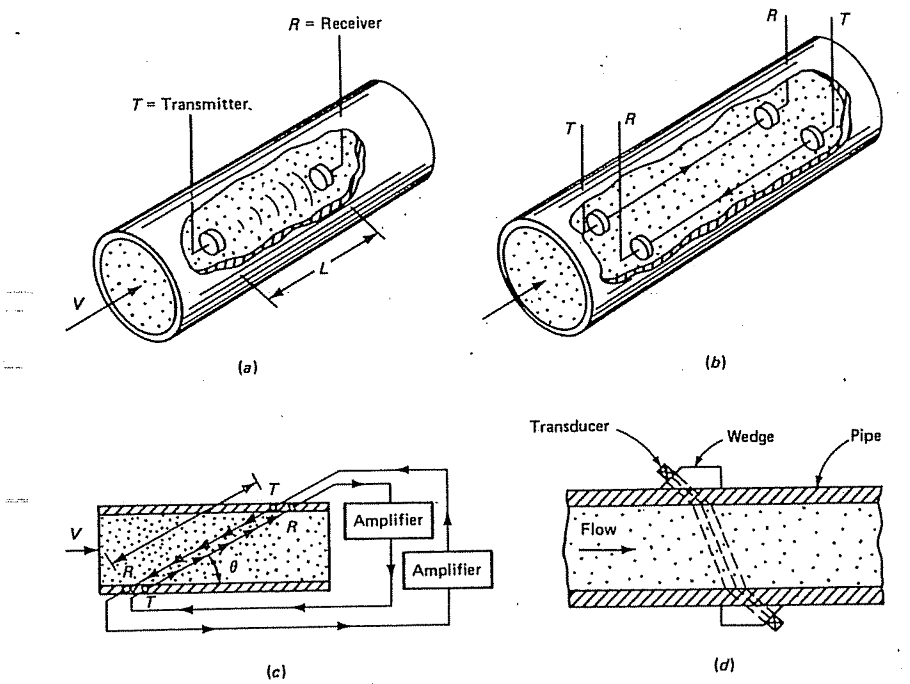


Figure 7.43 Ultrasonic flowmeters.

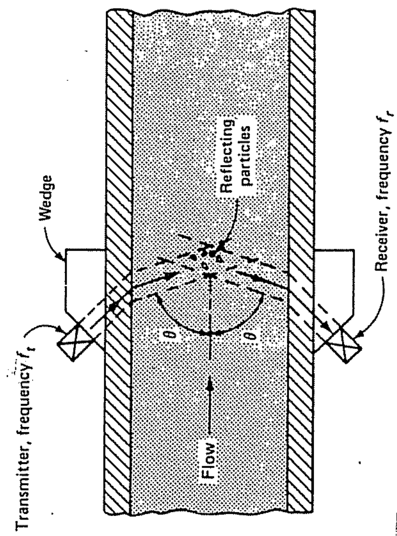


Figure 7.44 Clamp-on Doppler ultrasonic flowmeter.

Vortex-Shedding Flowmeters

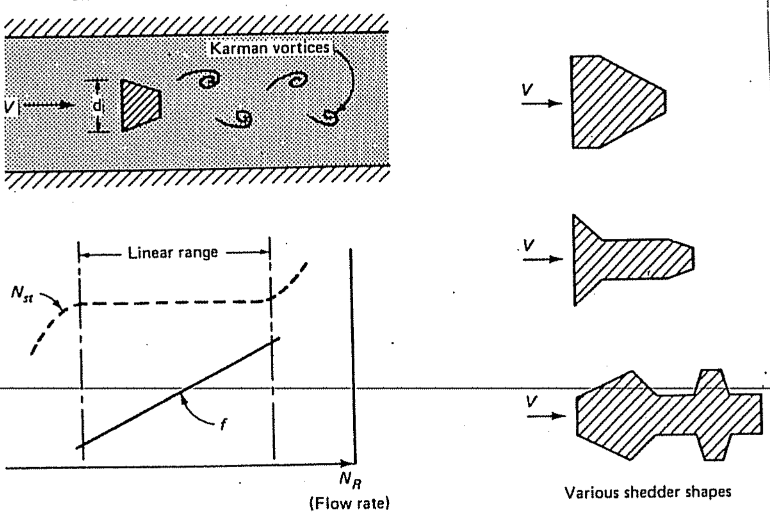


Figure 7.45 Vortex-shedding flowmeter principles.

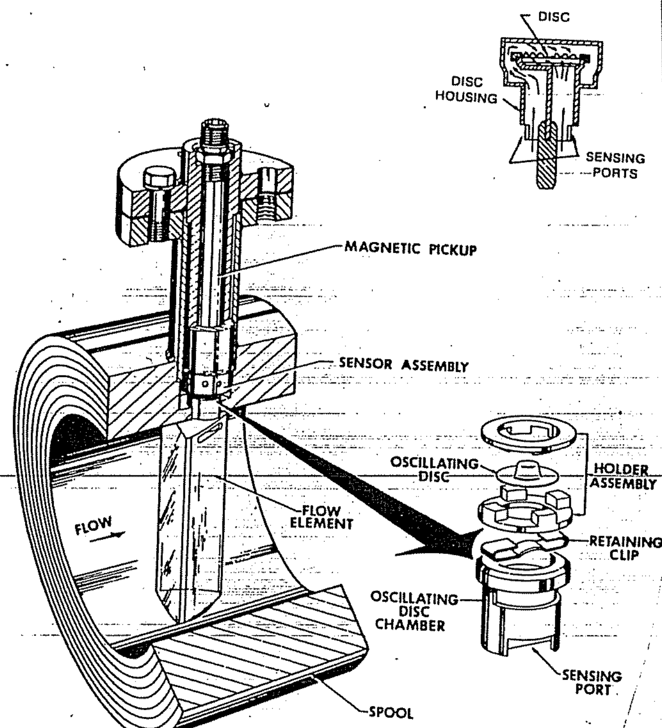


Figure 7.46 Vortex-shedding flowmeter details. (*Courtesy Neptune Eastech*)

– non sono quelli classici CORIOLY

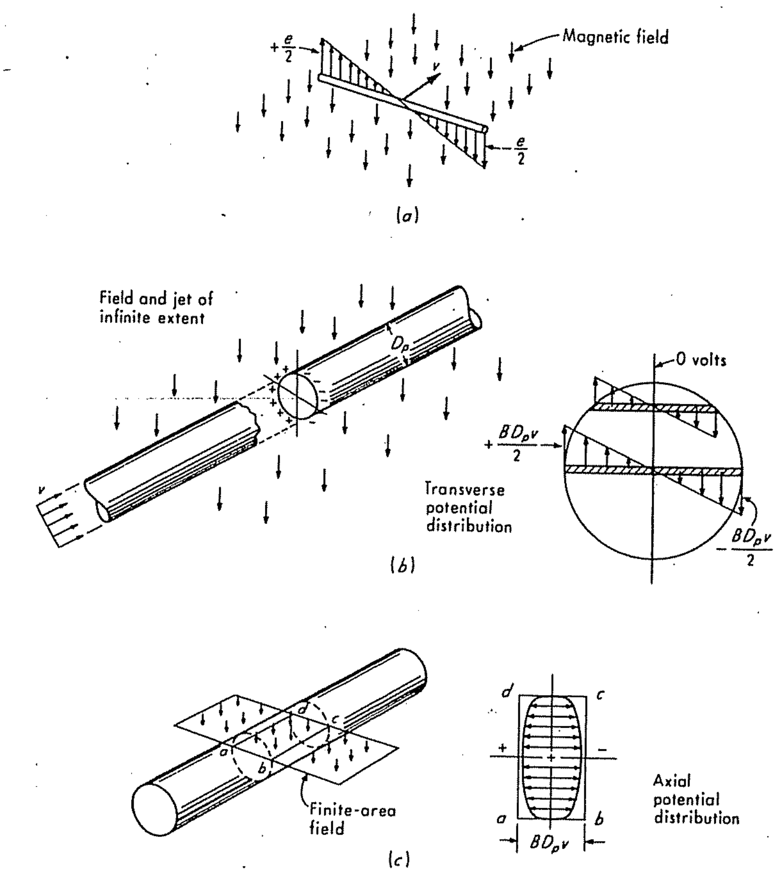


Figure 7.40 Electromagnetic flowmeter.

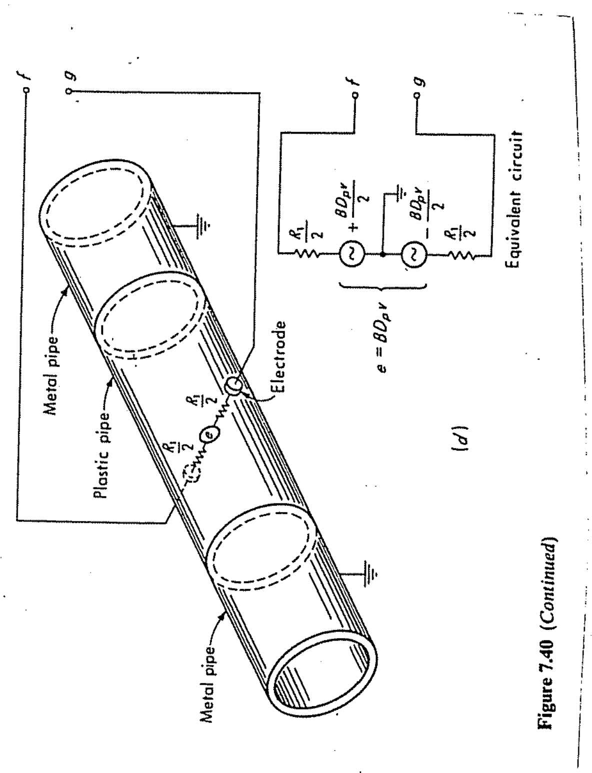


Figure 7.40 *(Continued)*

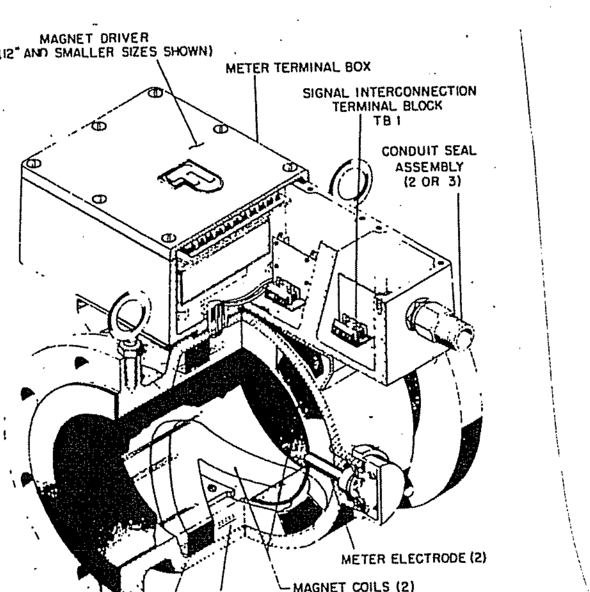


Figure 7.41 Construction details of magnetic flowmeter.

Laser Doppler Velocimeter[5]

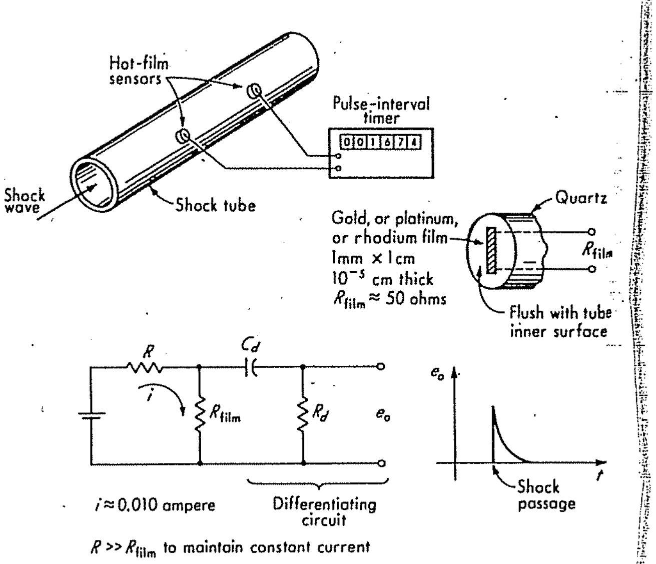


Figure 7.21 Thin-film velocity sensor.

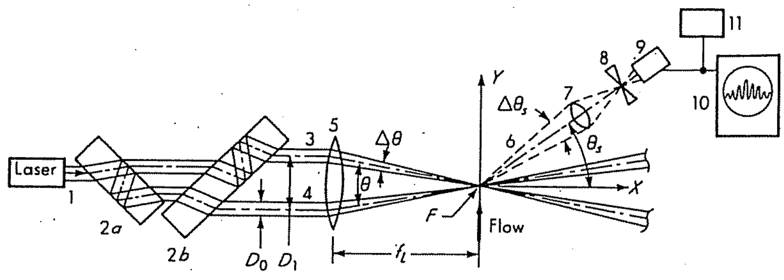


Figure 7.22 Layout of laser doppler velocimeter.

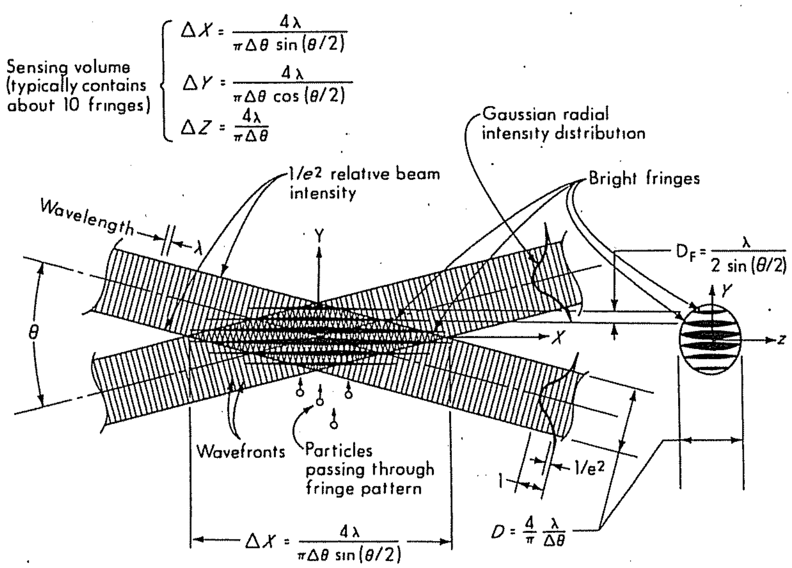
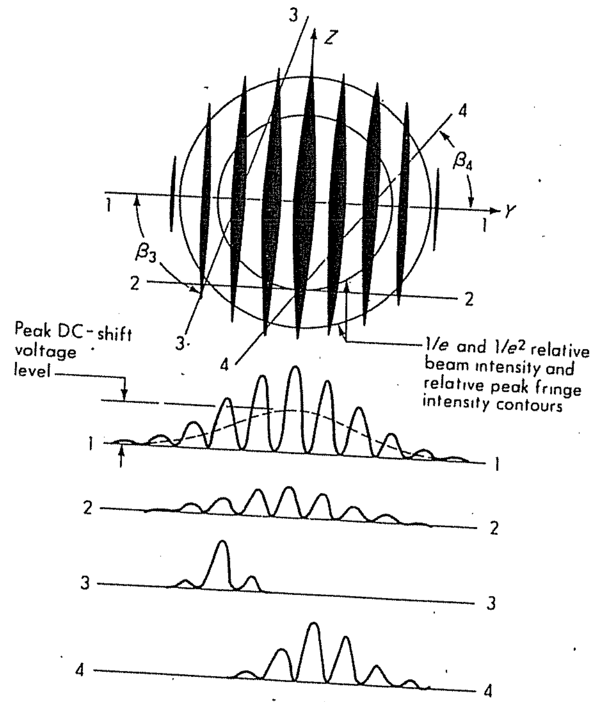


Figure 7.23 Interference fringes in sensing volume.



Signal amplitude vs. particle position near $X = 0$ for a number of particle trajectories. The indicated fringe width is proportional to the local peak fringe intensity.

Figure 7.24 Electronic signals from velocimeter.

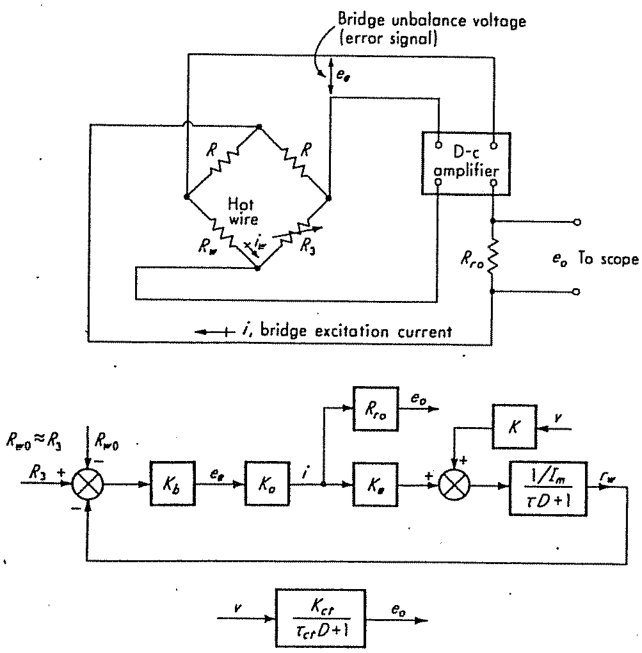
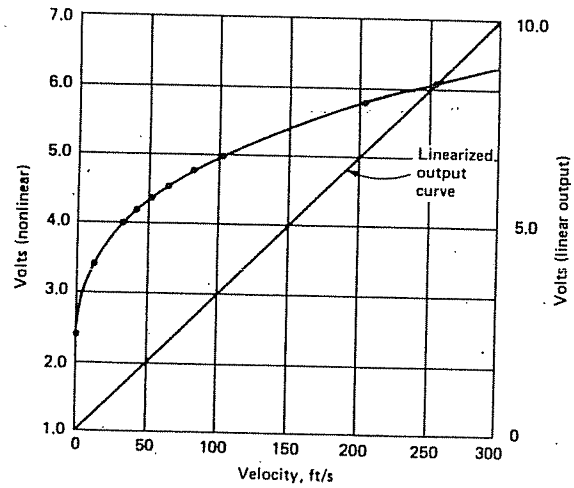


Figure 7.17 Constant-temperature anemometer.



Calibration for a 0.002-in (0.051-mm) diameter hot-film sensor in atmospheric air; 0 – 300 ft/s (0 – 91m/s)

Figure 7.18 Nonlinear and linearized responses of hot-film sensor.

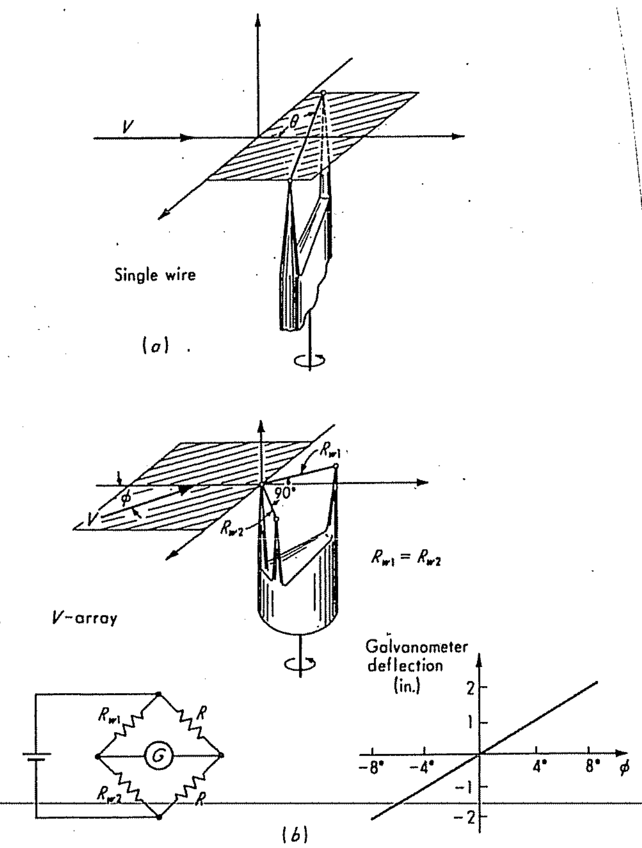


Figure 7.19 Flow-direction measurement.

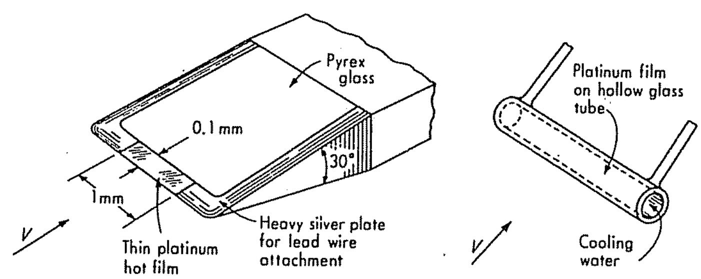


Figure 7.20 Hot-film sensors.

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ELECTROMAGNETIC FLOWMETERS

3. PRINCIPLE.

3-1. Operating Principle.

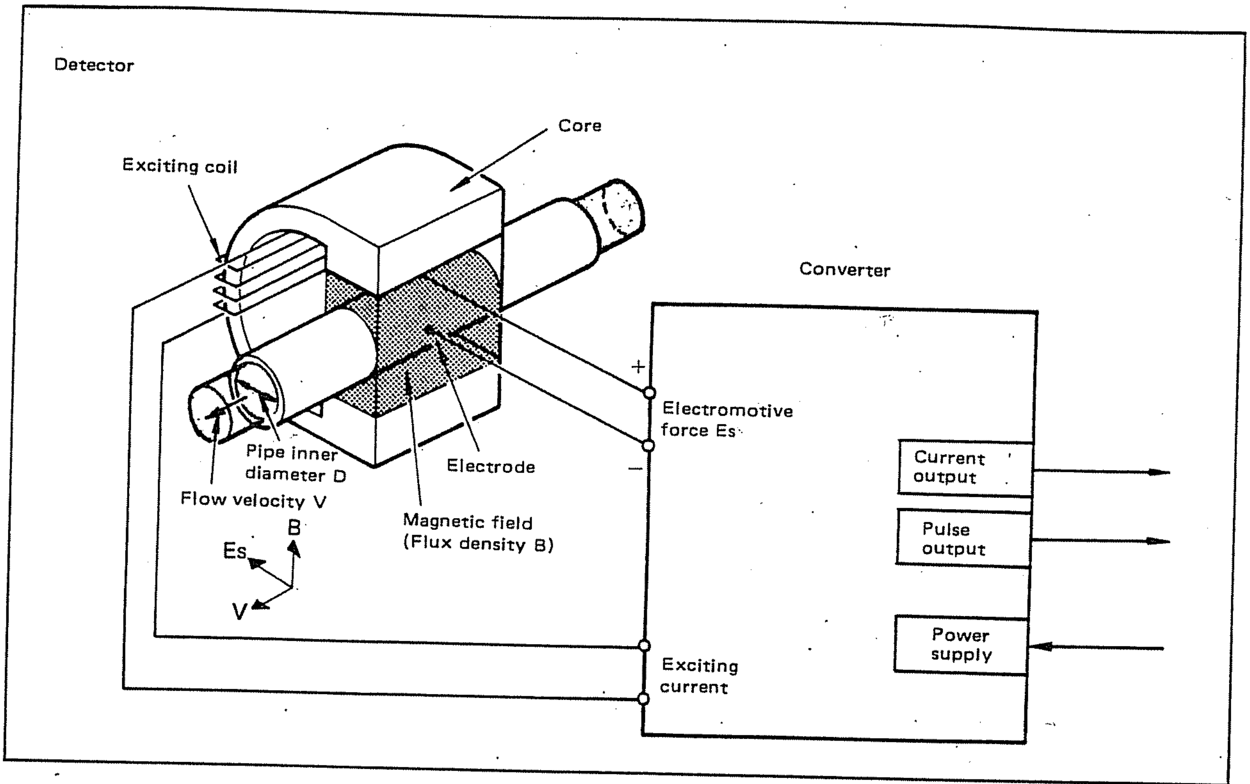

Figure 3-1. Operating Principle.

The principles of operation of the Magnetic Flowmeter are based on the "Law of Electromagnetic Induction" which states that when a conductor moves in a magnetic field in the direction perpendicular to the magnetic field, an electromotive force is induced perpendicular to the direction of conductor movement and to the direction of the magnetic field. The value of the electromotive force is proportional to conductor moving velocity and magnetic flux density. In Figure 3-1, when a conductive fluid flows at an average velocity of V (m/s) through a pipe whose inner diameter is D (m), in which a magnetic field of uniform flux density B (Tesla) exists, an electromotive force Es (volts) is induced perpendicular to the directions of the magnetic field and to the flow.

$$Es = D \cdot V \cdot B \text{ (V)} \qquad (1)$$

The flow rate Q is obtained from the following equation.

$$Q = \frac{\pi}{4} \cdot D^2 \cdot V \text{ (m}^3\text{/s)} \qquad (2)$$

From equations (1) and (2), is obtained

$$Q = \frac{\pi}{4} \cdot \frac{D}{B} \cdot Es \text{ (m}^3\text{/s)} \qquad (3)$$

Therefore, Es is expressed as shown below.

$$Es = \frac{4}{\pi} \cdot \frac{B}{D} \cdot Q \text{ (V)} \qquad (4)$$

If B is a constant, then Es will be proportional only to flow Q.

- **Interchangeability between Detectors and Converters.**

YEW's magnetic flowmeters can freely be combined with their converters by setting the value obtained as a result of multiplying a flow velocity span by the meter factor determined in the flowmeter calibration test (written on the flowmeter data plate) to the converter.