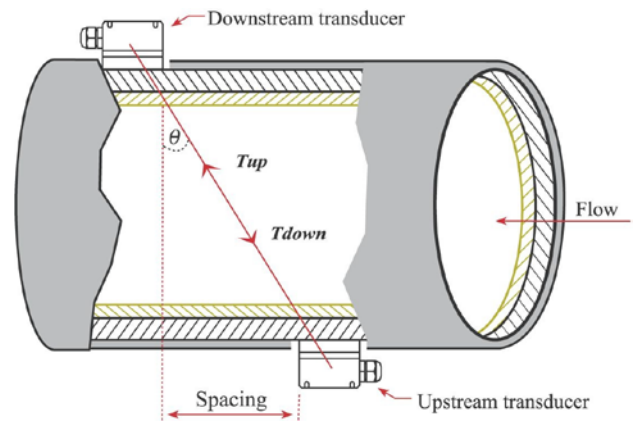


Principle of Operation

The TTM-500 is based on an ultrasonic principle of time differential. When an ultrasonic beam is transmitted through a flowing liquid, there will be a difference between the upstream and downstream transit time (travel time or time of flight), which is proportional to flow velocity. Within a flowing fluid, the counterflow transit time is more than direct flow transit time. The formula is as below.

$$V = \frac{MD}{\sin 2\theta} \times \frac{\Delta T}{T_{up} \cdot T_{down}}$$

θ



Notes: The angle between the ultrasonic beam and the flow

- M Transit times of the ultrasonic beam
- D The internal diameter of the pipe
- Tup Transit time in the forward direction
- Tdown Transit time in the reverse direction
- $\Delta T = T_{up} - T_{down}$

$$F = 900 \times \pi \times D^2 \times V$$

F is instant flow rate (unit: m³/hour)

D is inside pipe diameter (unit: m)

V is flow velocity (unit: m/s)

By nature of the theory of operation, the up and down stream ultrasonic beam timing can be measured very precisely resulting in a device that can determine liquid velocities in a closed, full conduit with an extremely high level of accuracy.