



## **HYBRID ULTRASONIC FLOW METERS**

### Operating Principle

Hybrid flow meters consistently measure liquid flow by using both Doppler and transit time ultrasonic hardware and algorithms. By automatically determining which principle to use, these meters are able to provide the most accurate measurement for the present conditions of the application. The dual technology makes them ideal for reliably measuring clean, dirty and gassy liquids.

When in transit time mode, the flow meter operates by transmitting and receiving a frequency modulated burst of sound energy between two transducers. The burst is first transmitted in the direction of fluid flow and then against fluid flow. Since sound energy in a moving liquid is carried faster when it travels in the direction of fluid flow (downstream), a differential in the times of flight will occur. The difference between the two travel times is then used to calculate the measured flow rate.

When in Doppler mode, the flow meter transmits an ultrasonic sound from its transmitting transducer into the flowing liquid. The sound will be reflected by sonic reflectors (gas bubbles or particulate) suspended within the liquid and recorded by the receiving transducer. If the sonic reflectors are moving within the sound transmission path, sound waves will be reflected at a frequency shifted (Doppler frequency) from the transmitted frequency. The shift in frequency will be directly related to the speed of the moving particle or bubble, resulting in a liquid flow rate that is interpreted by the instrument and converted to various user defined measuring units.