

# Ultrasonic Transit Time Technology Explained

Watch the Video!



## Reflecting on Technology

Ultrasonic transit time technology is used in many HVAC hydronic applications, but have you ever wondered what is going on between the transducers?

Ultrasonic flow meters that utilize the transit time differential principle measure the difference between transit times of an ultrasonic signal traveling back and forth between two transducers. The ultrasonic signal is generated by a pair of transducers that are mounted directly onto a pipe (any insulation must first be removed) so that one is at a fixed, pre-determined distance upstream of the other.

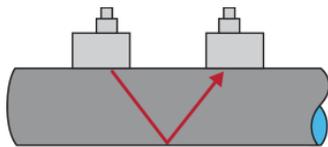


*Transducer Installation Directly onto the Pipe with Insulation Removed*

One transducer sends out an ultrasonic signal directly through the pipe wall in the direction of the flow of the fluid. This signal is received by the second transducer and the process is then repeated in the opposite direction against the flow. By measuring the difference in transit time of the ultrasonic signals propagating with and against the flow, the average flow velocity and direction of the fluid can be determined. When there is no flow, the transit times are equal. When there is flow, the signals traveling in the direction of flow require less time than when traveling in the opposite direction. This difference in transit time is directly proportional to the flow velocity in the pipe.

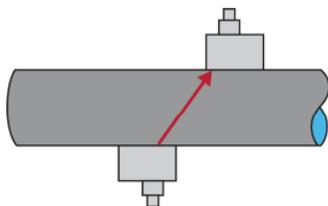
## Flexible Mounting Options

Ultrasonic transducers can be configured to operate in either Reflect, Direct, or Double Reflect modes (commonly called V, Z, & W configurations respectively). The choice of operating mode is dictated by the size, material, and age of the pipe; and determines the appropriate mounting option for the transducers onto the pipe.



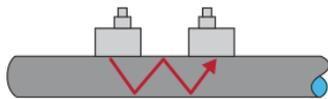
**Reflect Mount (V)**

The most common is the Reflect Mount. The transducers are inline with each other making separation distance and alignment easy.



**Direct Mount (Z)**

The Direct Mount provides a shorter sonic path which will improve signal strength in difficult pipe conditions such as older and/or corroded piping. The shorter path also minimizes the distance between transducers and can be the best option if mounting space is limited.

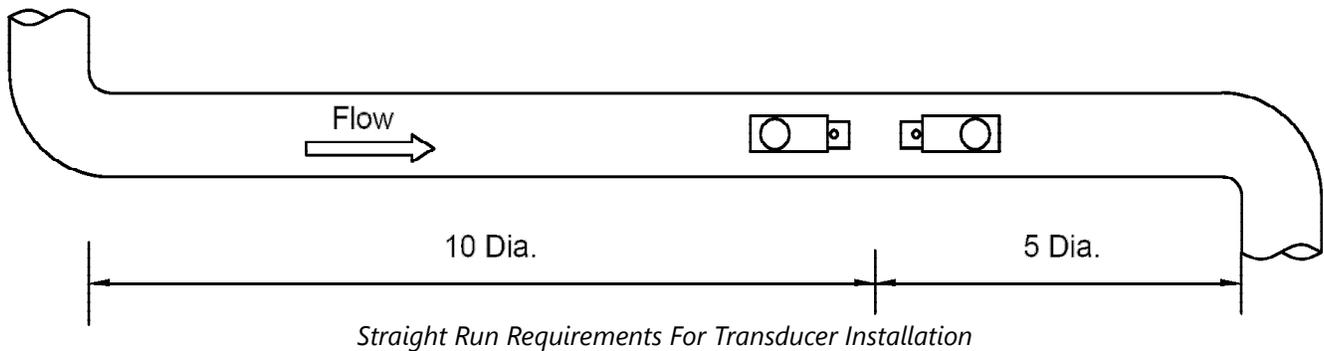


**Double Reflect Mount (W)**

The Double Reflect Mount is ideal for smaller pipe installations. The longer path ensures the transducers won't touch and the lengthened transit time reduces measurement error.

## Straight Run Requirements

For best results, straight run requirements should be taken into consideration when selecting the transducer installation location. Transducers should always be installed on a straight run of pipe free of bends, tees, valves, transitions, insertion probes and obstructions of any kind. The typical rule of thumb is a minimum of ten straight unobstructed pipe diameters upstream and five diameters downstream of the installation location.



## Ideal Uses for Ultrasonic Transit Time Technology

Clamp-on ultrasonic transit time flow meters are a non-intrusive option for flow measurement and ideal for retrofits, or when cutting into the pipe / system shut-down are not an option.

Because the ultrasonic signal must travel to the far pipe wall and back, the pipe should be full of liquid and have very little solids or bubbles (<2% by volume) to ensure propagation of the flow signal is not inhibited.

Ultrasonic transit time technology works best in HVAC hydronic applications including:

- Chilled water
- Hot water
- Condenser water
- Water/glycol
- Steam condensate (pumped)
- Domestic/municipal water
- Process water & other clean (non-conductive) liquids



ONICON F-4300 Clamp-on Ultrasonic Flow Meter / Thermal Energy Measurement System

## Find The Right Solution For Your Application

To learn more about ultrasonic transit time flow meters and how they can help you accomplish your flow measurement goals, [contact our experts today!](#)

[Discover More About ONICON's F-4000 Series Clamp-on Ultrasonic Flow Meters](#)