

Clamp on Ultrasonic Flow Meters - Your Questions Answered

Why use clamp-on ultrasonic flow meters?

Clamp-on ultrasonic flow meters have no moving parts, no wetted parts and can be installed in almost any application without interrupting the flow or the process. The Siemens Sitrans range (formerly Controlotron) can be used on most processes including liquids, slurries and gases.

Installations and retrofits are very cost effective as pipe size increases.

The sensors are clamped to the outside of the pipe with no parts passing through the pipe wall to wear, cause pressure drops or interfere with the flow and drastically reduce maintenance.

How do clamp-on ultrasonic flow meters work?

Transit Time systems have two transducers, either mounted on opposite sides of the pipe (direct mode) or in line on the same side of the pipe (reflect mode). Both transducers send and receive signals to each other, with the signal travelling with the flow reaching the receiver point quicker than the signal travelling against the flow. This difference in time is used to calculate the flow rate. Correctly set up, extremely high accuracies can be achieved. Doppler systems require particles to be in the process fluid and will not work on clear fluids.

Transducers transmit acoustic signals of known frequency which are then reflected by the particles and picked up by a receiver. The received signals are analysed for frequency changes.

The resulting mean value of the frequency change can be directly related to the average velocity of the particles moving with the process fluid.

Sitrans is available with both Transit Time and Doppler transducers for use with the same flow meter, Transit Time being the preferred method of measurement.

Are all clamp-on ultrasonic flow meters the same?

No. Most manufacturers work with shear mode or narrow beam technology. They have a range of fixed frequency transducers. Transducers are chosen to match as close as possible to the frequency of the pipe wall they are to be used on but are rarely a perfect match. The result is that a high voltage signal (usually around 600V) is required to force the acoustic signal through the pipe. The signal is often distorted and only a small portion of the beam is clean and usable.

Wide beam technology as developed by Siemens (formerly Controlotron) and used in Sitrans meters do not use fixed frequency transducers. The variable frequency transducers are selected based on pipe material, OD and wall thickness and will actually use a signal which matches the pipe wall frequency. Only 15 volts is required to pass the matched frequency signal through the pipe wall. Matching the frequency means the pipe wall is also used as a transducer. The result is a very clean beam with no distortion. The full beam width can be used and is much less likely to suffer from beam blow-out due to process variations and velocity changes. It also allows installation on slurries and process with high aeration up to 45%. Narrow beam technology is typically at 10% to 15% aeration.

Are clamp-on ultrasonic flow meters accurate?

Yes. If configured correctly with high precision transducers accuracies to 0.5% to 1% can be achieved. Models are also available for custody transfer applications for use in oil and gas industries with accuracies to 0.1%.