Ultrasonic Sensors for Flow Metering

Piezoceramics in Ultrasonic Applications

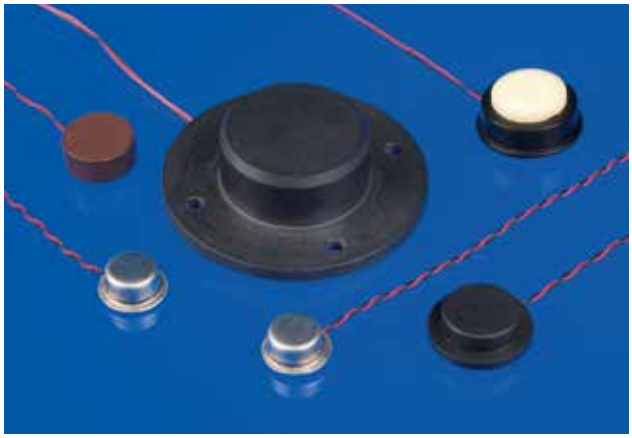
CeramTec
THE CERAMIC EXPERTS

Flow Sensors for Ultrasonic Metering

CeramTec presents its ultrasonic flow sensors, ideal for use in ultrasonic metering of gas, water and sub-metering applications. Designed using our world class piezoelectric materials and expertise in transducer design and manufacture, this product range is suitable to world leading temperature and pressure classifications.

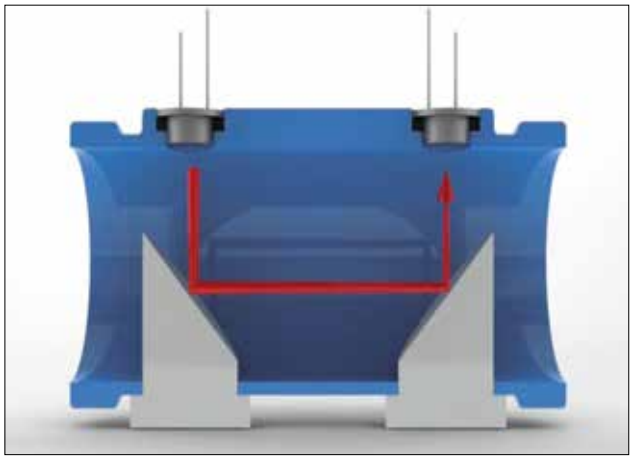
Gas Flow Measurement

For gas flow meter applications the design, selection and use of high quality matching layers is particularly important to ensure high sensitivity and optimal bandwidth. We offer two standard air coupled sensors ideally suited for this application.



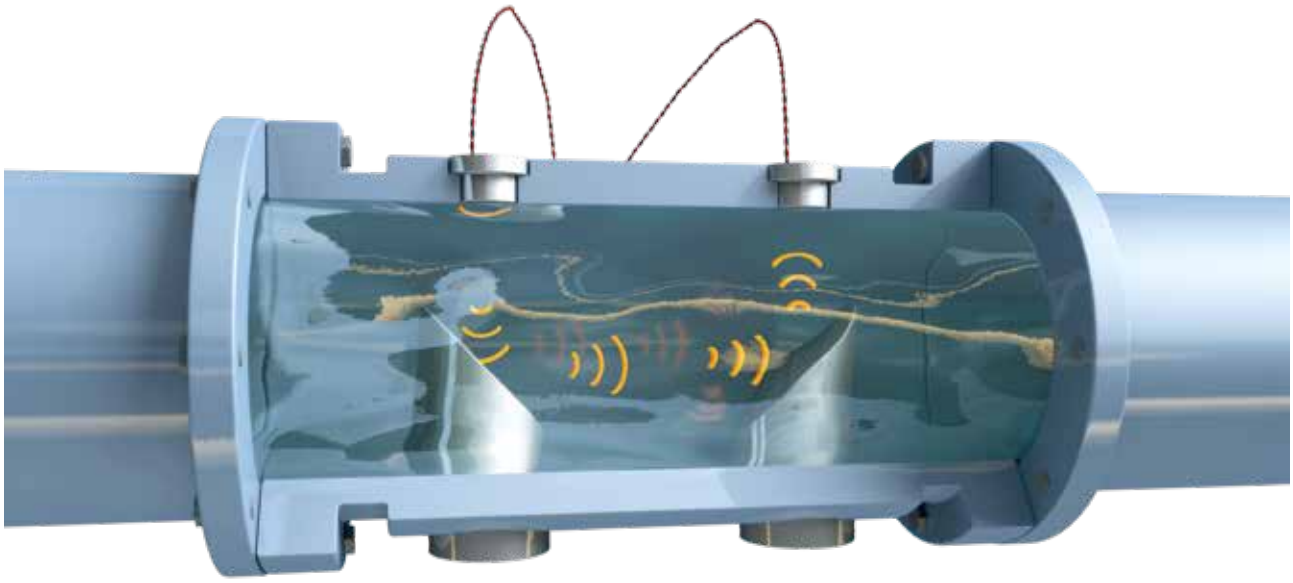
Water Flow Measurement

For liquid applications the design and manufacture of the sensor housing is particularly important to ensure the sensor is able to operate reliable under high pressure and within a wide range of temperatures. Our water coupled sensor is ideally suited for these applications. We can also custom designs for particularly challenging environments, particularly well-suited for operating up to 150°C.



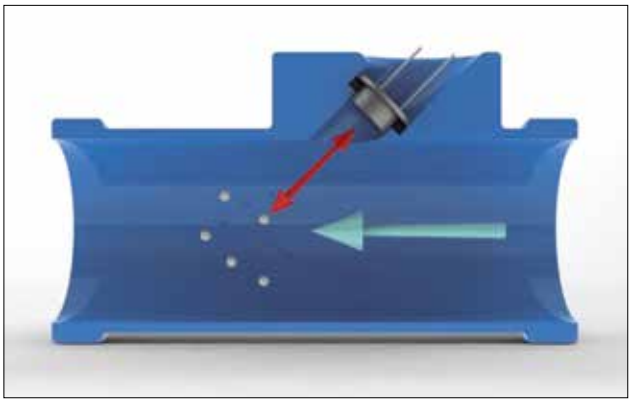
Measuring the flow of clean liquid can be achieved by mounting transducers at an angle, by reflective blocks, or by channelling the flow stream between the sensors.

CeramTec offers a manufacturing service for reflective blocks made of alumina, proven to show better acoustic properties and less degradation over accelerated lifetime testing of over 20 years – a study undertaken by Loughborough University.



Water Coupled Flow Sensors for Ultrasonic Flow Metering

CeramTec presents its new range of water coupled ultrasonic sensors, ideal for applications such as water metering, heat metering and any other fluid measurement devices. The sensors are available in a variety of different frequencies, sizes and materials. These are also available for customisation to enable our clients, unique advantages in the market place.



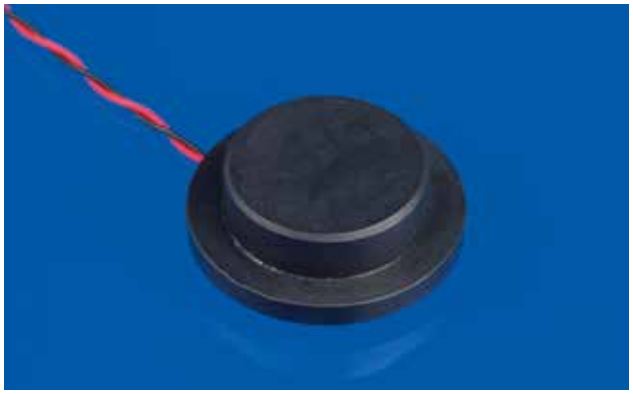
Flow Tubes

CeramTec also offers a service to help get you going as fast possible, we offer a flow tube complete with sensors for those new and existing to the technology. This way all that is left to do is choose the correct electronics set up for you – if you are looking for advice, we are always happy to help.

Doppler flow measurement

Alternatively it is possible to measure flow rate with a single transducer placed at an angle clamped onto the pipe. Entrained air bubbles in the stream of fluid reflect the transmitted wave back to transducer.

Nominal resonant frequency	1MHz, 2MHz or 4MHz
Bandwidth for a pair (-6dB)	> 20%
Receive signal at 100mm separation for two transducers (reference operating voltage)	> -5dB to -9dB
Insulation resistance at 250V	> 1GΩ
Operating temperature	1°C to 120°C
Storage temperature	-10°C to 130°C
Maximum burst pressure	50-80 Bar
Housing material	Thermoplastic, Stainless Steel, Ceramic



Ultrasonic Sensors for Gas Flow Measurement

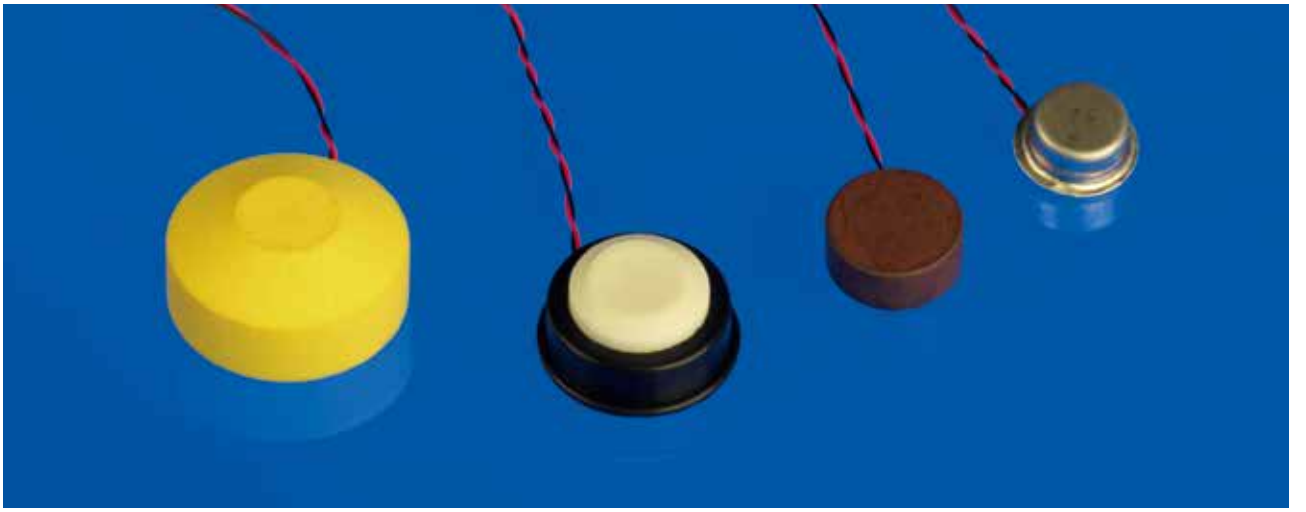
These new Ultrasonic Sensors for Gas Flow Measurement from CeramTec are intended to transmit and receive ultrasonic waves across a gas channel for time of flight measurement of gas flow.

Using 2 or 3 of these transducers, in applications such as Smart Metering of natural gas, can provide flow information in 1, 2 or 3 dimensions or air-coupled level sensing of liquids and solids.

For maximum sensitivity and bandwidth there is a choice of frequencies between 200kHz and 400kHz – these can be customised upon request.

Custom sensors are available with a pressure rating of up to 30,000 PSI and sensitivity better than -40dB, customised air coupled sensors for industrial applications with temperature tolerances exceeding 200°C are available upon request.

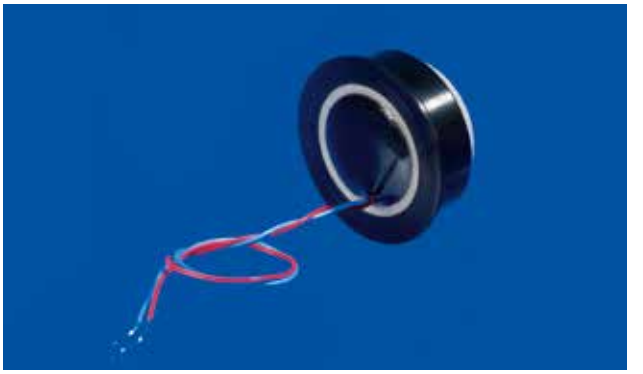
	200kHz Sensor	**400kHz Sensor**
Electrical Specification	All measurement made at 23°C in air and 50% R.H.	
Nominal drive frequency	200kHz ± 5%	400kHz ± 5%
Maximum instantaneous drive voltage	90Vp-p (single cycle)	
Minimum paired sensitivity	-70dB measured peak-to-peak in air, driven at a 20 cycle burst at 200kHz across a 160mm air channel	-50dB measured peak to peak in air, 20 cycle burst at 400kHz across 160mm channel
Bandwidth	50kHz minimum	50kHz minimum
-3dB Beam width at 200kHz	10° +/-2°	5° +/-1°
Capacitance	2500pF +/- 20%	400pF +/- 20%
Tan Delta	0.035 maximum	0.035 maximum
Insulation resistance at 250V	1GΩ MIN	1GΩ MIN
Operating temperature in air	-20°C to +70°C	-20°C to +70°C
Operating temperature in natural gas	-10°C to +40°C	-10°C to +40°C
Operational relative humidity	0% to 95% non-condensing	0% to 95% non-condensing
Pressure Rating	8 bar	8 bar



Custom Sensors

Custom Sensor and Transducer Design and Manufacture

Our design team is able to accurately model and present custom sensors – using cutting edge prototyping and analysis tools. This ensures that we are able to provide rapid solutions and focus on quick and accurate delivery, as we know how important this is to our customers. Please see the table below, for guidance on which sensor type is suitable for you.



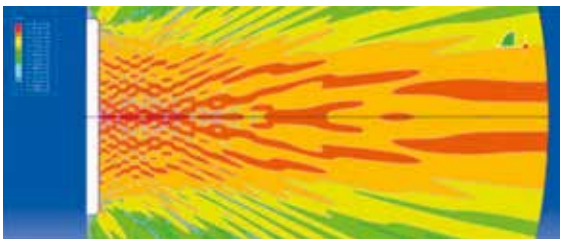
Transmitter Driven with a 3Vp-p Square Wave	Minimum Housing Geometry	Frequency	Receive Signal (Vp-p)	Bandwidth	Pressure rating (tested maximum)	Thermal stability
Stainless standard	½ Inch	1MHz	0.5 to 1	Good	50 bar	Excellent
Ceramic standard	9/16 Inch	1MHz	0.5 to 1	Good	100 bar	Outstanding
Thermoplastic	9/16 Inch	2MHz	> 1	Excellent	100 bar	Excellent
Stainless 2MHz	½ inch	2MHz	> 1	Excellent	50 bar	Excellent

Membrane Assemblies

We also offer bonded assemblies to the temperature and pressure specification defined above. Flat or wrap around electrodes (bulls eye or moon configurations) can be offered, with gold, nickel or silver plating. The high density, high consistency materials offer exceptional frequency tolerance on piezoceramic shapes and assemblies (+/-1%).

Unique Application Development

Additionally our R&D team has excellent experience working with different materials for unique applications. We specialise in creating high temperature and high temperature solutions, specifically useful in industrial applications. These temperature ranges can exceed 200°C and reach pressures of up to 30,000PSI.



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