



TFS

STANDARD ULTRASONIC TRANSDUCERS

PRODUCT INFORMATION

Fluenta's ultrasonic transducers are designed to be a non-intrusive method of measurement capable of being used in difficult, rapidly changing process conditions and fluctuating flow velocities.

With an operating temperature range of -70°C to $+145^{\circ}\text{C}$, this transducer is suitable for most standard flaring applications in both onshore and offshore installations.

The TFS sensors also feature dual ultrasound measurement modes, a mix of CF, or 'Continuous Frequency' and CHIRP signals. Using two signal types in combination, the first to localise the

Signal's 'Time of Flight' and the second to refine it to within a few nanoseconds, allows unparalleled precision, even in single-path applications. When calibrated, we can often achieve higher accuracy in single path systems than many alternative dual-path configurations.

With regulating and monitoring of venting and flaring increasing and becoming more demanding and challenging, the highly accurate readings provided by Fluenta transducers helps to future-proof your installations and ensure they remain compliant well into the future.

TFS OPERATING PRINCIPLES

Why Ultrasonic?

Unlike other technologies, ultrasonic measurement is not impacted by changing compositions or cleanliness of the gas flow. This enables it to deliver good repeatability regardless of turndown ratio or temperature range. With the current available technology, ultrasonic transducers are the only devices which can deliver highly accurate results in flaring applications. While regulations typically ask for 5% accuracy today, ultrasonic transducers future-proof the installation for when regulations inevitably tighten and require higher accuracies.

Fluenta transducers are also designed to be non-intrusive and without any moving parts which means less fouling and minimal maintenance required. With the FGM 160 flow computer being able to be installed up to 50 meters away, Fluenta transducers offer flexibility in installation in addition to being able to be removed from the line without expensive shutdowns.

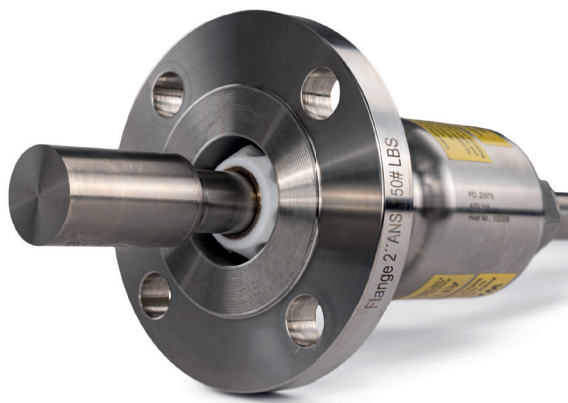
How TFS sensors work?

A piezo-electric crystal is mounted inside the titanium housing at the front of the transducers. It is attached to a front membrane. When the crystal is subjected to an alternating electrical signal, it generates an ultrasonic signal of the same frequency. Vice versa when it receives an ultrasonic signal it generates an electrical signal of the same frequency. Thus, both transducers in a pair act as receivers and emitters.

The difference in time of flight in both directions, with and against the flow, is analysed by the FGM 160 to calculate the axial gas flow velocity and volumetric flow rate in the pipeline with a potential accuracy of $\pm 1\%$.

Being compatible with pipe diameters from 6" to 72", Fluenta's ultrasonic transducers are suitable for a wide range of applications.

TFS TRANSDUCER SPECIFICATIONS



Functional Characteristics

Transducer Type	Ultrasonic/time of flight/ wetted non-intrusive
Materials	SS316/Titanium (custom materials may also be available)
Certifications (temp range -70 to 120C)	IECEX, ATEX, NRTL (CSA), TR-CU, INMETRO
Measurement Generated	Volume and Mass flow, gas velocity, molecular weight, density, pressure, temperature
Service Requirements	Annual clean and calibration
Resolution	0.003ft/s (0.0008m/s)
Dimensions	In operation: 0.71m Retracted: 1.03m Cable up to 50m

Operating Conditions

Temperature	-70°C to +145°C (-94°F to +293°F)
Operating Pressure	11.6 to 145 psiA (0.8 to 10 barA)
Flow Velocity Range	0.03 to 120 m/s (0.1 to 394 ft/s)
Pipe Sizes	6" to 72" (for pipe sizes out of this range please contact a Fluenta representative)
Process Connections	2" or 3", 150# or 300# lateral flanges
Straight Pipe Needed	10 x ID Upstream 5 x ID Downstream
Transducer Installation	42° to 48° angle depending on size of pipe
Configurations	Single Path and Dual Path

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