SFMS
SENSORS AND FLUID MANAGEMENT SYSTEMS

AMETEK



FUEL & INERTING

Fluid Densitometer

Overview

AMETEK's fluid densitometer builds on the legacy of a military sensor which has been in service for over 20 years. The sensor features several key improvements to make the product more accurate and less expensive.

The densitometer uses a torsional mode natural frequency to determine density in real time, providing an accurate and reliable indication of fuel density over the temperature ranges typically encountered in aircraft fuel tank applications. It is designed to operate in all aircraft fuels encountered worldwide.

One end of a spring is driven torsionally to resonance using an oscillating electrical signal by a piezoelectric crystal, the other end of the spring is allowed to freely vibrate at its natural frequency. This end is "coupled" with the fluid media and natural frequency changes in response to the fluid density are measured on a second drive piezoelectric crystal.

The primary output is an AC voltage having a frequency that varies with density. Density is calculated from the output frequency via the equation: p = a + b / frequency2, where a and b are constants determined during calibration. The standard method of acquiring the frequency in a microprocessor based system is with a timer/counter chip having a two-second gate time insuring high resolution.

Safety

The intrinsically safe design is certified for operation in fuel tanks.

- Capacitance is negligible compared to wire capacitance
- Meets FAR part 25 requirements
- Max current limited by 2K ohm series resistors on all wires to sensor



Features

- *High accuracy over extremes in both fuel, temperature, and viscosity*
- *Output can be provided in flight as well as at ground check*
- *Provides stable air check output for diagnostics after installation*
- *Suitable for use in flowing fuel applications such as ground or inflight refueling systems*
- *Torsional vibration mode less sensitive to structural input error*
- *Insensitive to pressure changes*
- *Piezoelectric crystals used rather than fine solenoid coil windings*

Fluid Densitometer

Specifications

ELECTRICAL CHARACTERISTICS

Voltage: +7 VAC
Amperage: 5 milliamp

ENVIRONMENTAL CHARACTERISTICS

Temperature: -67° to 185°F (-55° to 85° C)
Accuracy: +0.4% at -67° to 140°F (-55° to 60° C)
Viscosity: Up to 30 centistokes
Operating Pressure: 0.1 to 1.4 bar
Repeatability: +0.04%
Long Term Drift: +0.03% per year

PHYSICAL CHARACTERISTICS

Sensing Weight: 4 oz. (.11 kg)

OTHER CHARACTERISTICS

Output signal: 4-20 mA or proportional DC voltage

Integrated digital interface available for fully compensated system integration

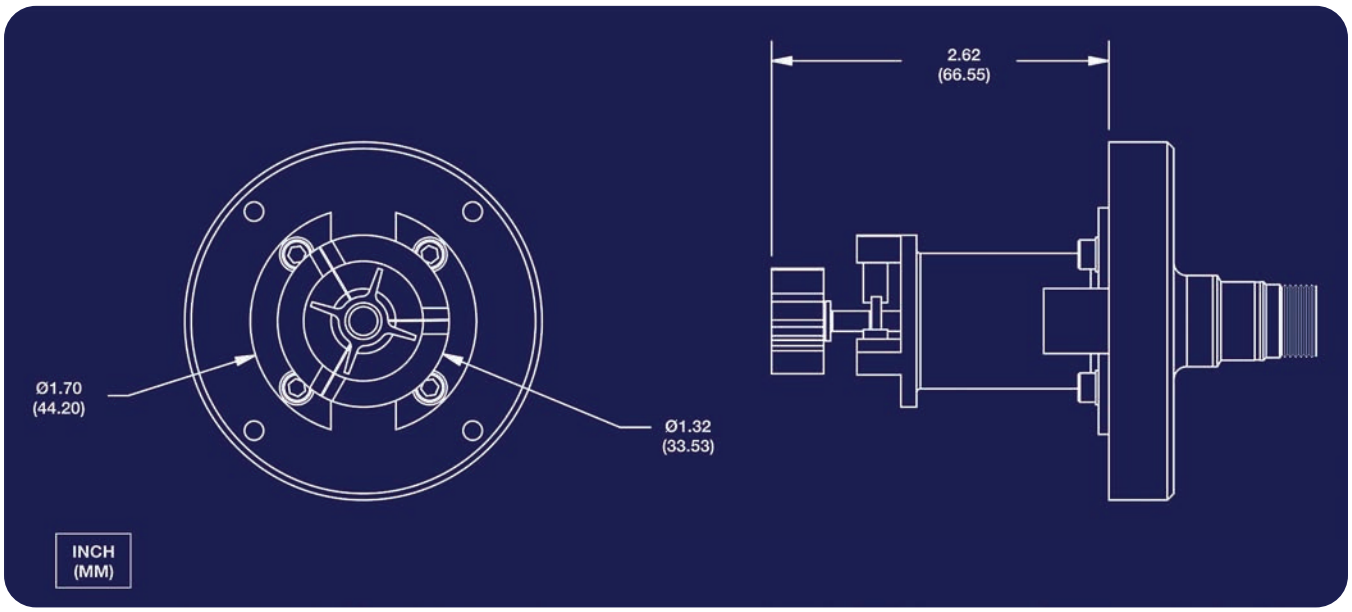
CONSTRUCTIONS

- NiSpanC alloy torsional spring
- PZT crystal oscillators
- Stable ceramic fluid couplers
- High temperature solder
- Fuel resistant polymer plastic support
- Flexible mounting or housing designs available

SYSTEM CONSIDERATIONS

The densitometer is typically used in the calculation of fuel mass using volumetric fuel quantity measurement inputs. In this system, the densitometer is driven by Fuel Quantity Indicating System (FQIS) electronics. AMETEK drive and measure circuitry would be made available to facilitate proper density measurements in any customer system design.

Dimensions



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