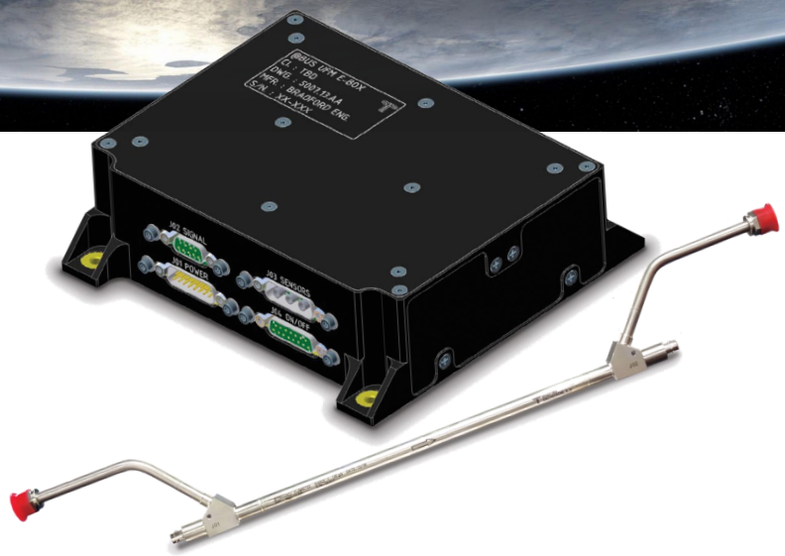
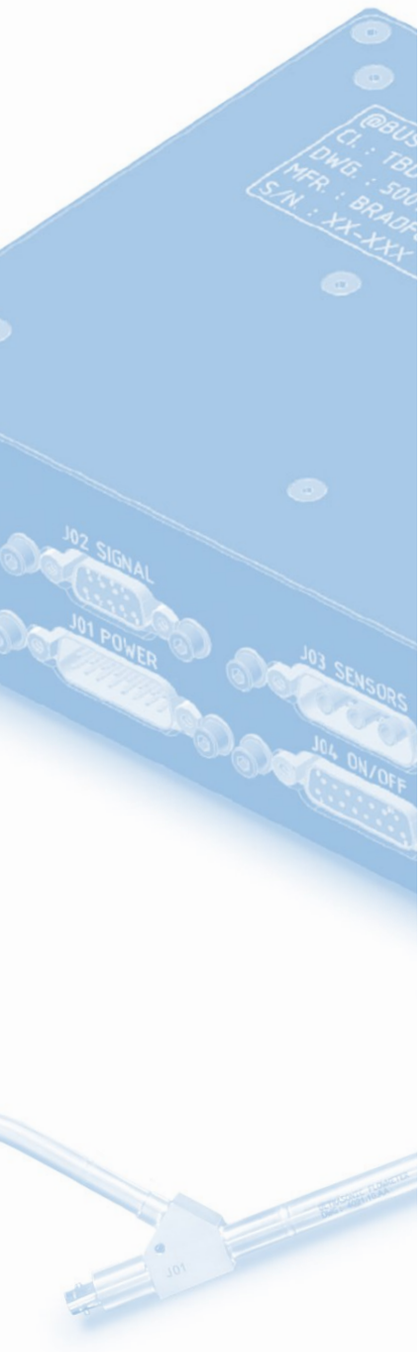
ULTRASONIC FLOW METER



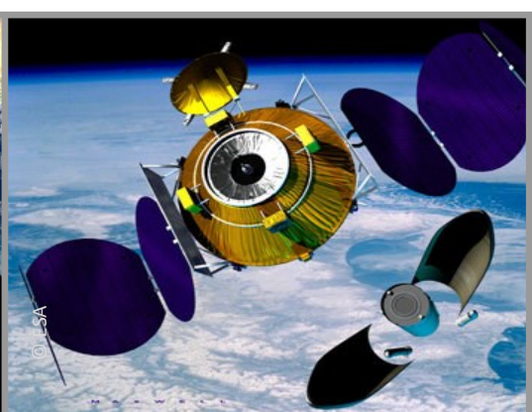


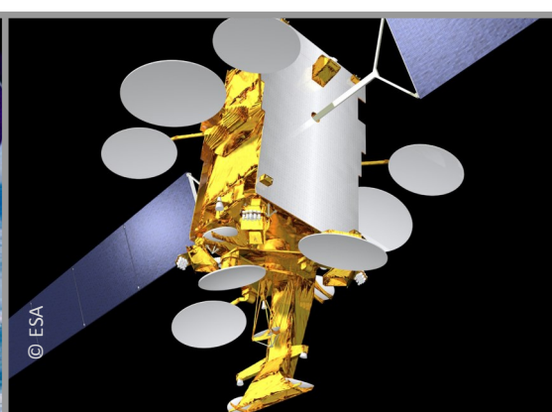
The Ultrasonic Flow Meter (UFM) provides a highly accurate direct and rapid measurement of liquid mass flowrate, e.g. propellant consumption in satellite bi-propellant propulsion systems. Because of its non-intrusive nature, the unit imposes negligible pressure losses.

The Ultrasonic Flow Meter principle is based on the so-called propagating or transit-time flow measurement method, which is the most suitable method for accurate measurements with liquid media. Two transducers are both used to send an ultrasonic signal and to receive the signal propagated through the fluid. Since the fluid is moving, the signal transit time in the downstream direction is shorter than the transit time in the upstream direction. This difference is proportional to the flow velocity, from which in turn the volume flow rate can be derived. The measurement is independent of the sound velocity of the liquid, hence is medium independent. Because of the fast response time, both steady-state Liquid Apogee Engine massflow and Reaction Control Thruster pulses can be recorded. The flowtube can be fully welded as integrated part of CPS tubing. Each flowtube is delivered with dedicated E-box with signal processing electronics.

Key Advantages

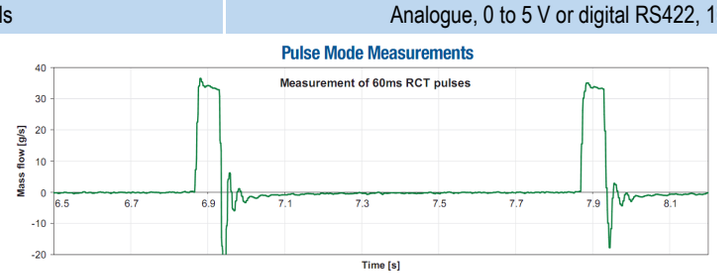
- Pre-qualified for telecom/GEO (Hi-Rel EEE-parts) applications
- Excellent performance characteristics
- High-accuracy thermal calibration
- Optional totalizer and empty flowtube detection
- Heritage for on-ground RCT characterizations (hydrazine), Refuelling subsystem prototyping and GEO CPS demonstration
- Production heritage of Titanium and stainless steel versions





Ultrasonic Flow Meter

Characteristic	Performance / Interface
Medium Compatibility	Hydrazine, MON, MMH, IPA, GHe, GN_2, GXe, Deionized H_2O, HFE
Flowrate Range	0-300 g/s (adaptive to customer requirements)
Response Time	< 5 msec
Pressures	> 26 barA
Proof Pressure Factor	2 times operating pressure
Burst Pressure	4 times operating pressure
Internal/External Leakage	< 10^{-8} scc/sec GHe
Measurement Accuracy	±0.5% FS (momentaneous flow) to ±1% FS (totalizer)
Mass	<200 g (flowtube), <1200 g (E-box)
Envelope (l x w x h)	643 x 18.5 x 81mm (flowtube), 179.5 x 161 x 51mm (E-box)
Fluidic Interface	Weldable 3/8" Tube Stub (flowtube)
Structural Interface	4 bolts M4 (E-box)
Wetted Materials	Ti6Al4V and/or AISI 316L
Operational Life	18 years
Sine Vibration	5-20 Hz: 11mm 0-Peak 20-80 Hz: ±16g
Constant Acceleration	20g in each Axis Direction
Random Vibration	20-80 Hz: Increase 6.9dB/Octave to 0.32g^2/Hz 80 - 350 Hz: Constant at 0.32g^2/Hz 350-443 Hz: Decrease at -6 dB/Octave 443-950 Hz: Constant at 0.2g^2/Hz 950-2000 Hz: Decrease at -6 dB/Octave
Shock	Half sine wave 200g for 0.5 msec in each axis
Thermal Vacuum Qualification	-20° to +75°C Non-Operating
EMC Requirements	According MIL-STD-461E
Radiation Resistance	100 kRAD(Si) EEE – parts
Power Supply Voltage	+28 VDC or +100 VDC Single
Power Consumption	<7.5 W
Output Signals	Analogue, 0 to 5 V or digital RS422, 16 bit (DS) serial word



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ABOUT

Bradford is a high-tech European developer and manufacturer of satellite control sub-systems and components.

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