Philtec Application Note

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Extreme Applications - Pressurized Cryogenic Fluids

ROCKET ENGINES for SPACE LAUNCH VEHICLES

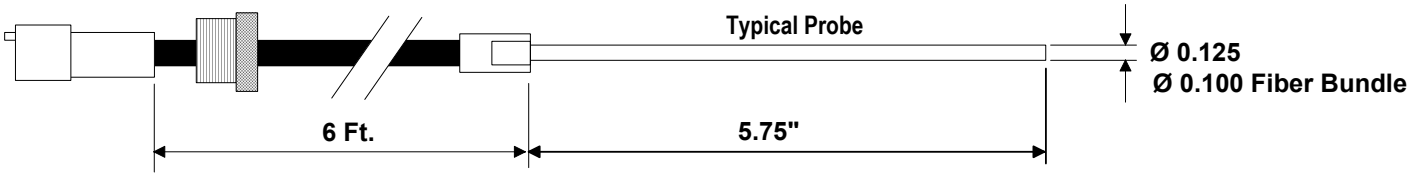
A new generation of LOX/Methane engines are under development, and many have used Philtec's FODS (Fiber Optic Displacement Sensors) for rotor dynamics measurements in the testing phase. Fiber optic probes are an ideal sensor choice in these applications where they are exposed to pressurized cryogenic fluids.

Philtec Experience with Cryogenic Turbopumps

2008 Philtec provides a dozen probes for installation and testing in cryogenic turbopumps at these operating conditions:

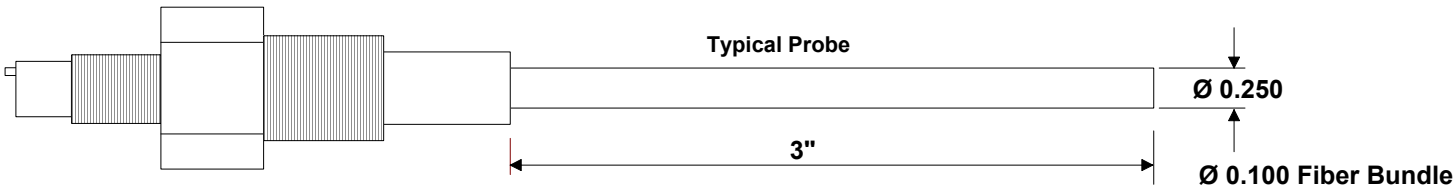
- Liquid Hydrogen, -420°F, 2500 psi max. pressure

Test engineers report good experience with the probes, saying they operated flawlessly over some 30 cycles at cryogenic temperatures....



2016-2017 100 sensors are delivered to companies testing advanced turbopump designs. The sensors are used to monitor the radial and axial displacements of the rotors in a variety of cryogenic fluids, such as:

- Liquid Hydrogen, -300°F, 1000 psi max. pressure
- Liquid Oxygen, -297°F, 5000 psi max. pressure
- Liquid Methane, -297°F, 7500 psi max. pressure



Footnote: Liquid oxygen-Liquid methane (LO2/LCH4) was originally proposed in the 1960's as an alternate to hydrogen to power spacecraft for long-duration manned Mars expeditions. It's density enables easier storage in small tanks, compared to what would be required for liquid hydrogen. Methane is also abundant in the outer solar system. It can be harvested from Mars, Titan, Jupiter, and many other planets and moons. With fuel waiting at the destination, a rocket leaving Earth wouldn't have to carry so much propellant, reducing the cost of a mission.