Minimum Requirements Document

Polytec VibroFlex Connect QTec “or equal”
Fiber Optic Laser Doppler Vibrometer System
04 June 2026

Scope: The Air Force Research Laboratory (AFRL/RQVV) requires the purchase and delivery of a Polytec VibroFlex Connect / QTec “or equal” Fiber Optic Laser Doppler Vibrometer System and ancillary items for the Structural Validation Branch at Wright-Patterson Air Force Base, Ohio.

Background: AFRL/RQVV has utilized laser doppler velocimetry technology for decades to validate the performance of high-temperature structural components. A new laser technology, QTec, developed by Polytec, enables highly accurate velocity measurements on any surface type without requiring surface treatment. AFRL/RQVV currently operates one Polytec 3-D QTec scanning laser vibrometer system, which has successfully validated the use of QTec technology in high-temperature vibroacoustic environments.

The development of a fiber-based system now allows for the embedding of QTec laser systems within the facility's radiant heating system. This enables the capture of high-temperature velocity measurements of structural components. In contrast, current methods involve large, heavy accelerometers that are limited to temperatures up to 1200°F and require special mounting considerations. These mounting conditions and the mass loading they introduce can limit the use of sensors on certain material systems, such as thin aircraft skins, where drilling can create stress concentrations or cause premature failures. Furthermore, high-temperature accelerometers exhibit large measurement uncertainties above 800°F.

The non-contacting, fiber-based Polytec QTec system eliminates these mass loading and mounting limitations and can be used at any temperature. This system will allow AFRL/RQVV to more accurately validate structural components when they are exposed to the extreme conditions of hypersonic flight.

Requirements/Salient Characteristics: The following salient characteristics are firm requirements and any “or equal” item must meet these characteristics:

- The laser wavelength must be 1550 nm to avoid destructive interference with the AFRL/RQVV quartz lamp radiant heating system.
- The laser system must include a fiber optic lens extender or an integrated fiber optic cable compatible with both a 1550 nm measurement laser and a visible spotting laser of any visible wavelength.
- The fiber optic lens and cable assembly must be a minimum of 6 feet in length.
- The system must have a minimum bandwidth of 50 kHz to facilitate data analysis up to a minimum frequency of 20 kHz.
- The system must be capable of measuring a minimum velocity of 12.5 m/s.
- The system must have a baseline noise floor below 75 µm/s on any untreated surface.
- The system must be fully functional at a standoff distance of up to 100 meters from the test article to the sensor.

- A measurement software management system, Polytec MDE-Controller software, capable of managing and controlling each sensor's settings must be compatible with at a minimum (8) units of the same model and expandable to more than (10) sensors. The software shall allow the integration of PSV-600-3D and PSV-500-1D sensors for data collection and display, define measurement geometry, adjust measurement system settings, acquire data, display operation deflected shapes, and export data in universal file format. The system must be compatible with existing government-owned Polytec software and hardware, specifically the PSV Software package, the VibroScan PSV-600-3D system, and the PSV-500-1D system.
- The system must provide an analog voltage output, with any range between 0 and 10 volts being sufficient.
- The system must include an option to display output in terms of displacement and acceleration.