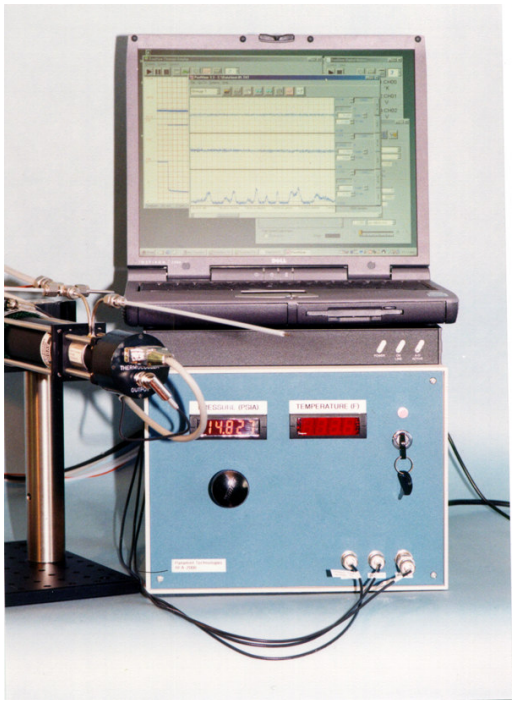
RFA Systems

Innovative Optical Instruments

Real-time Fuel-to-air Analyzer Model RFA-2000i



Specifications

•Infrared optical absorption based technique permits high speed measurement of hydrocarbon (HC) vapor

•Uses a simple 1/8 inch extractive suction probe 'stinger' for sample input

•High speed - 500 Hz frequency response with 12.5 mm pathlength absorption cell

•High sensitivity - 750 ppm CH_4 in Air with standard absorption cell (Phi= 0.013 min. equivalence ratio resolution)

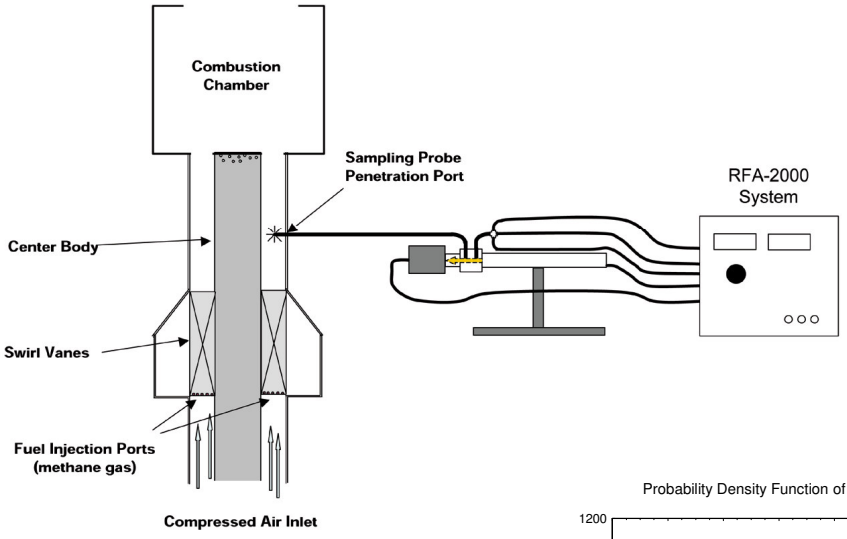
•Turnkey operation with all electronics self-contained in ruggedized enclosure

•Exclusive self-aligning optical design ensures reliable operation

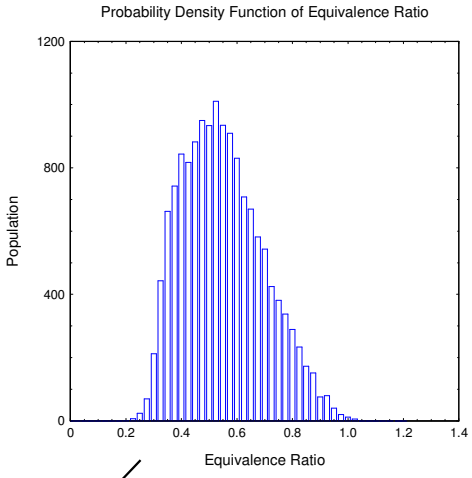
The RFA-2000i is a unique real-time fuel-to-air ratio (FAR) analyzer capable of measuring fluctuating FAR as fast as 500 Hz. The RFA-2000 is an ideal tool for testing fuel-injector mixing performance in gas turbine engines, IC engines and even furnaces and boilers. The RFA-2000i is especially suited for testing low-NOx fuel injector/mixer designs for lean premixed combustion systems. The RFA-2000i is the only commercially available, infrared absorption based, real-time HC analyzer that provides continuous time-history measurements of the fluctuating fuel vapor - information critical to the design and development of ultra-low emissions fuel injectors, fuel-air mixers and combustors.

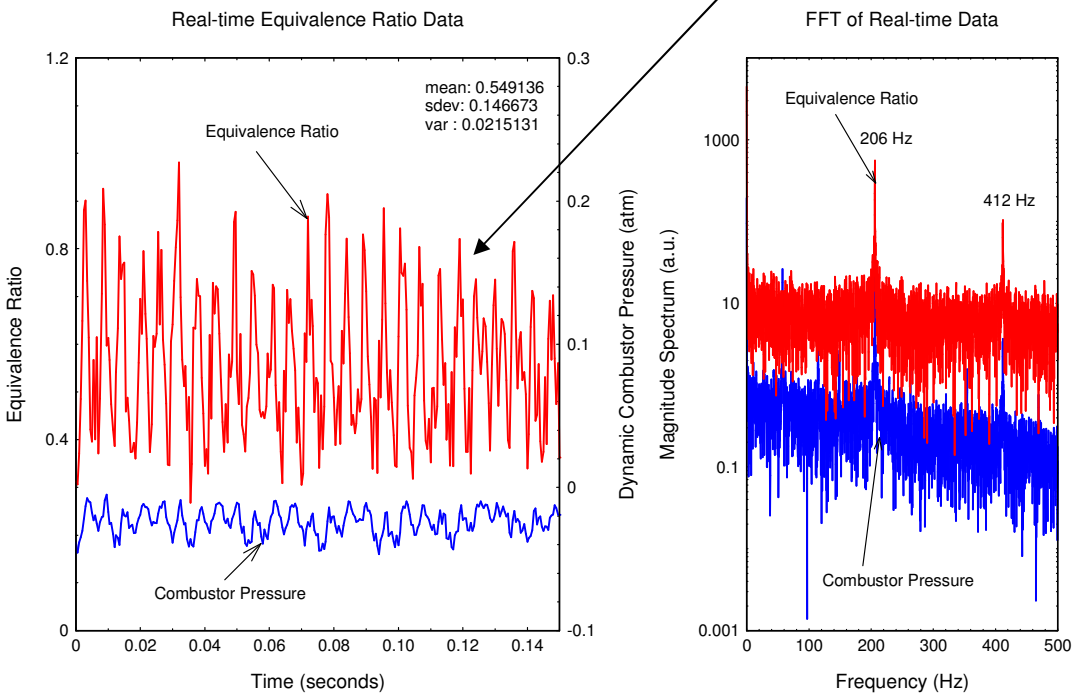
The RFA-2000i operates on the principle of optical absorption at 3.4 micrometers (for most HC based fuels). A 3.39 micrometer HeNe laser provides the light source whose optical transmittance through a miniature, low-volume absorption cell, is measured by a high sensitivity IR light detector. The RFA-2000i provides a convenient field-portable optical system that is easy to use, self-aligning, rugged and reliable. The RFA-2000 comes standard with 3 analog outputs: optical absorption, temperature and pressure from the absorption cell. These outputs are directly compatible with the user's own data acquisition system (or digital oscilloscope). A 12-bit 100 kHz portable data acquisition system using a notebook computer for true field portability is available as an option (shown). A standard 110 V wall plug and vacuum pump are required for operation.

Experimental Setup of Lean Premixed Combustor Measurements

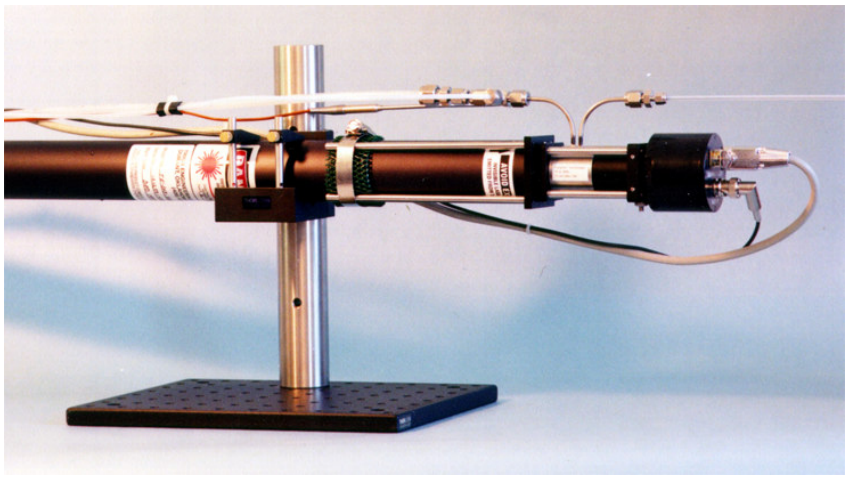


Sample data (below) from actual test of a lean premixed gas turbine combustor operating on CH_4-air at a setting of Phi=0.55. Note that fluctuations in equivalence ratio about the mean can be quite large. The mixing performance for this injector is instantly revealed on the histogram of the equivalence ratio (right). The excellent time resolution of the system reveals that the fluctuations in the equivalence ratio (206 Hz and 412 Hz) is highly correlated with the dynamic combustor pressure in frequency space (lower right).





Data provided by R. Dibble and J. Girard, U.C. Berkeley (2000).



Detail of sensor head and supporting optical base. The sample is fed in through the 1/8 in diameter stinger tube (top right) and passes through the self-aligning optical system before exiting through the 1/4 in diameter exhaust tube, connected to the main control unit. All control electronics and instrumentation are contained in the main control unit for ease of operation and convenience.

Physical Dimensions

• Laser Sensor Head - 27 in length x 2 in diameter, approx. 3 lbs

• Main control unit - 11 in deep x 11 in wide x 9 in high, approx 12 lbs

• Sensor mounting baseplate - 10 in x 10 in x 0.5 in thick

• Total system weight approx. 25 lbs

• System stored and shipped in foam padded ATA style case with wheels and retractable handle (airline luggage safe). Total weight with case, computer data acquisition system and accessories approx. 50 lbs. (system does not include user supplied vacuum pump)

Pricing

RFA-2000i with all accessories and transport case - $24,495

RFA-2000i with computerized data acquisition system - Call for pricing

Ordering Information:

RFA Systems, LLC
E-mail: info@rfasystems.com
http:// www.rfasystems.com