atmosFIRt

Portable multigas FTIR gas analyser for emissions monitoring

atmosFIRt is the latest generation of FTIR gas analyser technology from Protea in a portable or mobile form. The atmosFIR system improves upon previous FTIR technology and represents one of the most cost-effective and flexible analytical products on the market today. At the heart of atmosFIR is a high-resolution, robust and proven FTIR spectrometer offering high signal throughput, low-noise and long lifetime of components. AtmosFIR has been developed to incorporate the latest improvements and advantages in technology, including:

- Low cost of ownership
- Low maintenance cost
- Robust and light, including the latest in fabrication materials
- atmosFIR combines an FTIR analyser with an in-built sampling system and is designed for ppm-level emissions monitoring as a portable or bench-top unit or as part of an installed CEM system.
- atmosFIRt is provided in a rugged transportable case for mobile site measurements.

These advantages come with the benefit of improved performance over existing products, due to the new small, robust, high resolution interferometer with low noise measurement. AtmosFIR is fitted with a sensitive DTGS detector, operating at ambient temperature without need for liquid nitrogen or other cooled detectors. Protea continues to offer our powerful PAS software suite, training and support, so that the user is able to achieve the best performance out of the product.

Multi-component, multi-range portable FTIR gas analyser

Measure 1000's of gases with single unit

Software offers no-limit on number of gas measurements at once, using powerful PLS algorithms

Data can be downloaded and re-analysed offline for new gases

Built in O_2 sensor, heated inlet filter and sampling control

Specific Applications for atmosFIR:

- Stack Emission Testing
- Incineration and Combustion Gas Monitoring
- RealTOC measurement
- Speciated VOC with use of high resolution
- Abatement plant efficiency – inlet and outlet
- Ambient air monitoring from 0.5ppm
- Siloxane Measurements

Portable FTIR

atmosFIRt takes the standard 19" rack form of the atmosFIR multigas analyser and provides it in a field-ready portable form. The outer case is a high-IP rated shell providing robust housing for transportation and use on the most demanding of site installations. None of the features of the cabinet version of the atmosFIR have been lost:

- In-built O_2 sensor
- Heated inlet filter
- Automated N_2 purge valve
- Digital and analogue outputs

Highest Resolution Portable FTIR

Normally portable FTIR equipment suffers from low resolution measurement. The atmosFIR FTIR allows however allows for resolution up to 0.7cm^{-1} (unapodized) allowing for detailed detection and speciation of gas species.

With mobile FTIR equipment, site work often involves the investigation and understanding of emissions or process vents. With atmosFIRt the ability to measure complex mixtures down to low concentrations is available with the high resolution option.

However the real benefit of atmosFIRt is that it is variable resolution! So if there is need for measuring at 4cm^{-1} or 8cm^{-1} resolution, the atmosFIRt can be set to this resolution with a simple setting in software. No hardware changes are needed.

Fit-for-purpose

Protea was the first company in the UK to use FTIR for accredited stack emissions testing. Being users of the equipment as well as a manufacturer has allowed us to design the atmosFIRt hardware and software to meet the needs of engineers in the field.

- No need for pre-analyser sample conditioning unit
- Flexible sampling system configurations to suit
- Heated line support bracket
- Integrated heated line and heated probe controller with signals to FTIR
- In-built zirconia O_2 sensor for parallel oxygen measurements
- Option for Mass Flow Controller for:
  - Analyte Spiking
  - In-built Linearity Calibration from within FTIR software
- Software allows standard emissions test calculations automatically – Drift Correction, Lower Detection Limit (LDL) calculation, Residual Checks – all as per published standards.

Calibration Support

Protea can offer full and traceable calibration support from our laboratory in the UK. This includes calibrations of:

- Inorganic combustion gases over **wide ranges** (low ppm to %Vol)
- **Hundreds of VOC** species
- Acid gases such as **HCl, NH_3, HF, HBr**

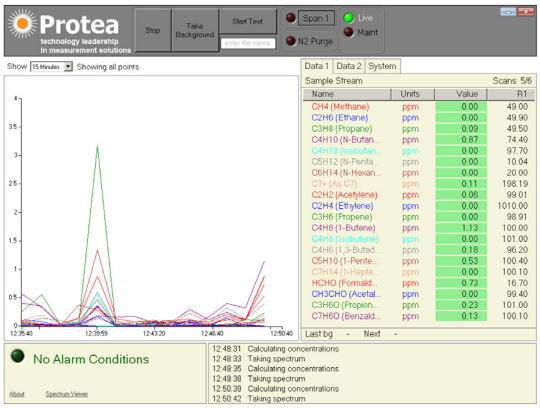
Users are welcome to join Protea for the calibration of their analysers for their own traceability and record keeping at our laboratory in the UK. All of our gas standards are traceable to **National Standards and ISO 17025** accredited gases can be sourced for calibration if needed.

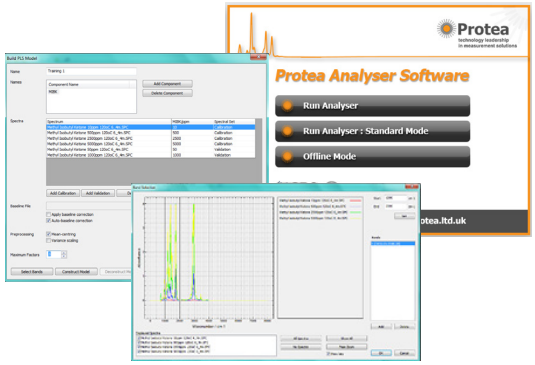
Call us on: +44(0)1270 872 000
Protea Limited. 10 Prosperity Court, Middlewich, Cheshire, CW10 0GD UK.

Easy-to-Use software

Through years of FTIR applications experience, Protea have developed our software platforms to allow both the novice user and the FTIR expert to get the most out of the atmosFIR analyser. PAS-Pro software gives fully automated operation:

- Touchscreen interface
- Detailed health and alarm status
- No limit to number of gas measurements
- No need for large spectral library to be kept on analyser PC
- Pass/Fail indication adheres to standard FTIR methods such as ASTM, US EPA, ISO and UK EA TGN
- Multi-range measurement with automatic range switching
- Separate Test Log for ease of data saving
- Separate Span Log for ease of data saving
- Sequence programing for multipoint measurement and automate span gas checks, purges etc.
- Full span gas audit within software – gas names, concentrations, certificate numbers
- Alarm response to heated sampling system
- All spectra are saved with sampling information – temperature, pressure, oxygen content, resolution for traceability





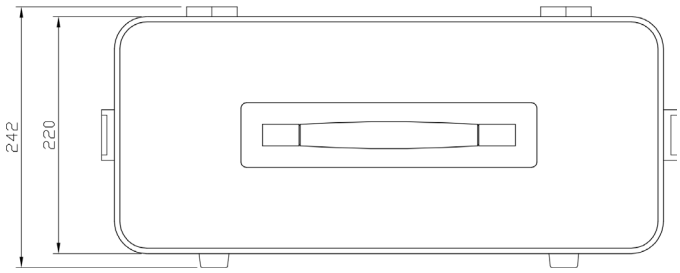
PAS is designed for expert user wishing to analyse data in greater detail:

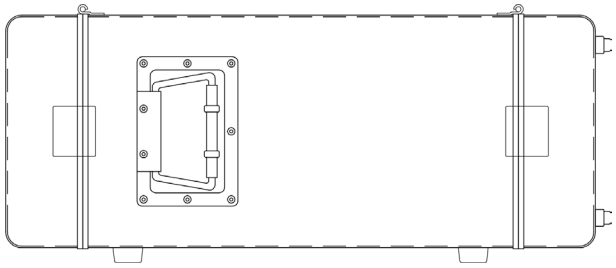
- Multivariate chemometric builders – PLS, CLS + more algorithms
- Analysis does not require full gas matrix speciation for accurate results
- Full residual spectral analysis
- Recalculation of all data for interferences or new gases
- Built-in Lower Detection Limit (LDL) calculator
- Built-in Drift calculator

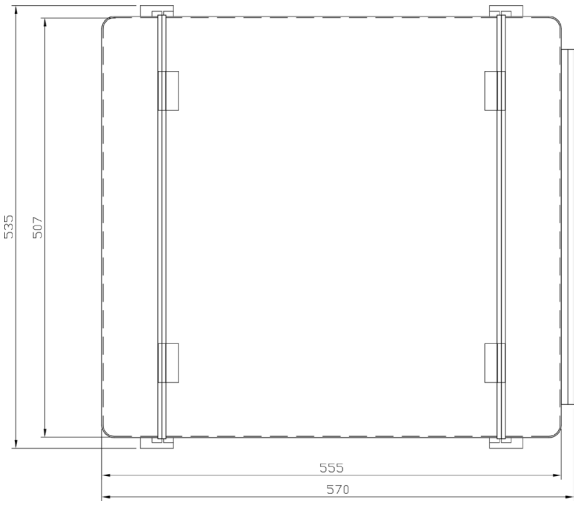
Hardware Specifications

Double-pivot interferometer with increased robustness. Permanently aligned optics, giving repeatable measurements and high light throughput. The scanning mechanism has a lifetime guarantee.

Resolution	1cm^{-1}, 2cm^{-1}, 4cm^{-1}, 8cm^{-1} typical resolutions, variable on application : 0.5cm^{-1} available as special	
Optics:	Zinc Selenide beam splitter (non-hygroscopic)	
Spectral Range:	485 - 8500cm^{-1}	
Reference laser:	Solid state laser (no scheduled maintenance required). Long lifespan (10 years) compared with HeNe laser	
Source:	Mid-IR source, with electronic stabilization for long lifespan	
Detector:	DTGS with signal sampling at 24-bit ADC	
Sample Cell:	Materials: Ni-coated Al cell. Proprietary alloy mirror substrate with multi-layer coating. Volume: 300ml Pathlength: 4.2m standard pathlength. 6m available as special Temperature: 180°C standard for combustion emissions. Variable on application	
On-board Sampling system:	Heated pre-cell filter for extra protection against dust Zirconia oxygen sensor for parallel O2 measurement Automated Zero Purge valve, with flow control Mass Flow Control for dilution and/or analyte spiking No need for separate pre-analyser sample conditioning box	Alarm relays Sample Signal Output 4-20mA outputs (optional)
Weight	21kg, depending on options	
Supply	100 - 250 V / 50-60 Hz	
Consumption	250W	







Typical Measurements for atmosFIR

atmosFIR runs a Standard Analysis Model with fixed acquisition parameters and chemometric analysis for common emission gases. This makes it incredibly simple to use even for users with no extensive FTIR background. Further analysis methods can be uploaded by the trained user or remotely by Protea.

Typical detection limit	<0.2ppm (gas dependent)		
Typical Response Time	120secs at 1cm^{-1} resolution. (T90, gas dependent).		
Short-term drift	<2% range		
Ambient temperature drift	<5% range		
Linearity (lack-of-fit)	<2% range	Repeatability (σ)	<1% range

Standard Application Model for common emission gases
Hardcoded analysis, no complex set-up required Switch on ➔ Zero ➔ Measure ➔ Report

Component	Ranges / mg/m3	Lower detection Limit (LDL) / mg/m3	Component	Ranges / mg/m3	Lower detection Limit (LDL) / mg/m3
CO	0-75; 0-1000	0.6	CH_4 (Methane)	0-50; 0-1000	0.1
NO	0-200; 0-600	1.0	C_2H_6 (Ethane)	0-50; 0-1000	0.1
NO_2	0-200; 0-600	0.6	C_3H_8 (Propane)	0-50; 0-1000	0.8
N_2O	0-50; 0-400	0.4	C_2H_4 (Ethene)	0-50; 0-1000	0.4
SO_2	0-75; 0-1000	0.6	HCHO (Formaldehyde)	0-20; 0-100	0.2
NH_3	0-15; 0-50	0.1	TOC (Indication only)	0-50; 0-1000	-
HCl	0-15; 0-100	0.2	H_2O	0-40%	0.02%
HF	0-15; 0-50	0.2	CO_2	0-20%	0.005%

Unlimited measurements	Standard Analysis Model ranges are not fixed – increase via simple span correction. Any number of additional gases can be added to the above list. Please contact Protea for specific gas requirements.
Measurement Units	Concentration: ppb, ppm, mg/m^3, %Vol Mass Emission: mg/hr, g/hr, kg/hr, te/a (utilising external flow input)