atmosFIR^air

FTIR Gas Analyser

For ambient air pollution and GHG measurement

The atmosFIR^air mobile gas analyser allows for immediate, continuous measurement of 1000's of gases.

Based on the same atmosFIR Fourier Transform Infrared (FTIR) analyser platform Protea uses in environmental emissions measurements, atmosFIR^air is a powerful tool for monitoring of ambient air pollution, emergency response and also analytical applications such as greenhouse gas (GHG) testing.

atmosFIR^air 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
- Embedded PC controller
- atmosFIR is provided in a rugged transportable case for field 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. atmosFIR^air includes our powerful patent-pending PAS-Pro software with AIR-IQ analysis enabling simple and direct gas analysis, 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

Software automatically detects new gases, using patented algorithms

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

Built in H2S sensor, inlet filter and sampling pump control

Specific Applications for atmosFIR^air:

- Ambient air pollution testing
- Thousands of VOCs detected
- GHG analysis
- Emergency response
- Occupational hygiene

Benefits of atmosFIR^air

- **Small volume gas cell**
- **Extra internal sensor options** (e.g. O2 or H2S measurement)
- **Patented algorithms to automatically identify and quantify gas concentrations**
- **Highest resolution portable FTIR**
- **Long-life components**
- **External pump for ease of service and flow rate change**

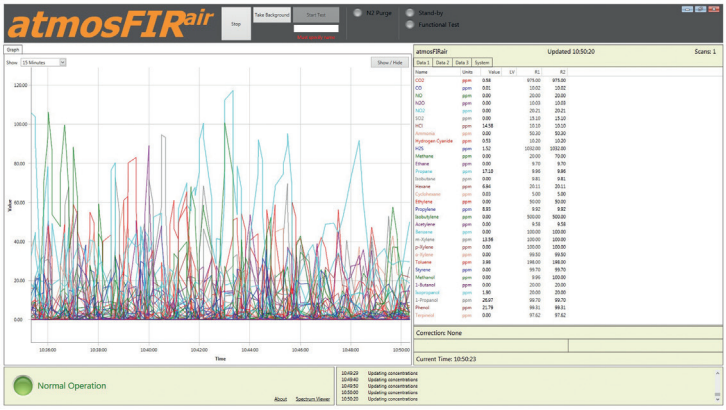
Wide Range of Gases and Applications

GHG Analysis

Gas	Range 1	Range 2	LDL
CH_4	0 – 20ppm	0 – 1000ppm	14ppb
CO_2	0 – 500ppm	0 – 10000ppm	2ppm
N_2O	0 – 10ppm	0 – 1000ppm	21ppb
Further gases included	**Range**		**LDL**
SF_6	0 – 10ppm		50ppb
Total CFC	0 – 10ppm		<100ppb
NH_3	0 – 10ppm		30ppb
O_3	0 – 10ppm		12ppb

Container monitoring

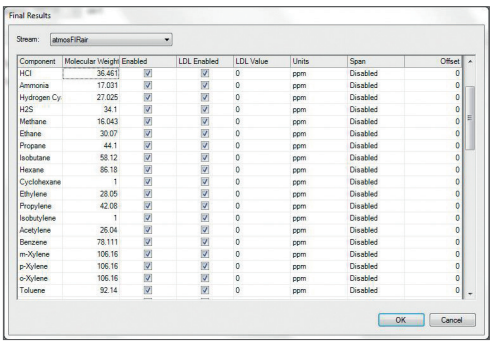
Component	Range /ppm	LDL/ppb
Ammonia	0 - 50	64
Hydrogen Cyanide	0 - 10	21
Phosphine	0 - 2	54
Benzene	0 - 50	868
m-Xylene	0 - 100	165
p-Xylene	0 - 100	174
o-Xylene	0 - 100	751
Toluene	0 - 100	656
Styrene	0 - 100	874
Ethanol	0 - 100	1025
Methanol	0 - 100	797
n-Pentane	0 - 100	677
Isopentane	0 - 250	287
Formaldehyde	0 - 2	11
Acetaldehyde	0 - 500	528
Acetone	0 - 100	1420
1,2-Dichlororthane	0 - 10	676
Chloromethane	0 - 1000	488
Methylene Chloride	0 - 100	910
Ethylen Oxide	0 - 25	785
Alpha Pinene	0 - 100	60
Chloropicerin	0 - 10	239
Methylbromide	0 - 50	497



Single simple user interface that can predict and measure thousands of gases

Emergency Response / Occupational Hygiene

Component	Range /ppm	LDL/ppb	Component	Range /ppm	LDL/ppb
Methane	0 - 20	72	Acetone	0 - 100	128
Ethane	0 - 10	30	Acetonitrile	0 - 100	4015
Propane	0 - 10	31	Ethyl Acetate	0 - 100	56
Isobutane	0 - 10	5	Dimethyl Ether	0 - 100	216
Hexane	0 - 20	21	Ethylene Oxide	0 - 100	206
Cyclohexane	0 - 5	1	Alpha Pinene	0 - 100	34
Ethylene	0 - 50	134	Limonene	0 - 100	741
Propylene	0 - 10	601	MIBK	0 - 100	667
Isobutylene	0 - 100	830	Chloromethane	0 - 25	954
Acetylene	0 - 10	47	Chloropicrin	0 - 10	525
Benzene	0 - 100	334	Chlorobenzne	0 - 100	939
m-Xylene	0 - 100	603	Chloroform	0 - 100	482
p-Xylene	0 - 100	120	Trichloromethane	0 - 5	431
o-Xylene	0 - 100	50	Dichlorofluoromethane	0 - 5	228
Toluene	0 - 100	511	Chlorodifluoromethane	0 - 5	53
Styrene	0 - 100	1033	Tetrachloroethylene	0 - 100	93
Methanol	0 - 10	205	Difluoromethane	0 - 5	171
1-Butanol	0 - 20	599	Pentafluoromethane	0 - 5	35
Isopropanol	0 - 20	333	1,1,1,2-Tetraflouroethane	0 - 5	219
1-Propanol	0 - 100	410	Phosphine	0 - 100	526
Phenol	0 - 100	602	Arsine	0 - 100	13
Terpineol	0 - 100	194			
Formaldehyde	0 - 20	25			
Acetaldehyde	0 - 100	356			
Proprionaldehyde	0 - 100	334			
Silane	0 - 100	29			
Formaldehyde	0 - 20	25			
Benzaldehyde	0 - 100	76			



No limit to the number of gases that can be enabled in atmosFIRair software

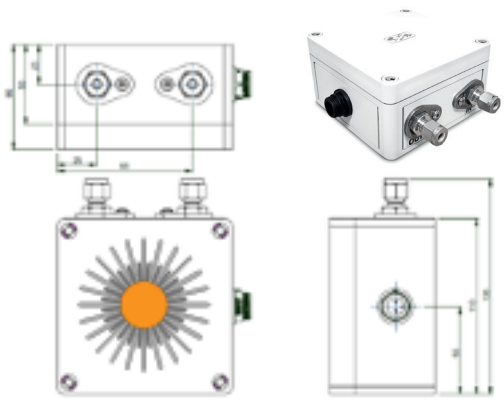
Field ready

With Protea's flexible package platform for atmosFIR^air, the analyser is ready to go for field measurements. Portable due to integrated carry handles and with removable wheels for airline style transport, everything is stored with the atmosFIR^air.

- Embedded touchscreen control. No need for laptop or PDA
- Storage for sample pump, sample tubing and filter
- Operatable in both vertical (Desktop) and horizontal (convenient placement when in the field)

Flexible, variable pumping

The external PUDC mini-pumping unit provides mobile, flexible pumping across a wide range of applications. Offering easy maintenance external to the analyser, the PUDC is swappable for differing applications at different flowrates. Controlled and powered from the analyser, the PUDC can be operated in a post-analyser or pre-analyser orientation depending on the application needs



Easy-to-Use software

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

- Automatic start-up/purge/sampling/measurement
- 100's of gases measured in real-time in < 30mins
- Touchscreen interface within analyser

Analysis

- Patented automatic gas identification algorithm
- No limit to number of gas measurements
- Analysis does not require full gas matrix speciation for accurate results
- No need for large spectral library to be kept
- Pass/Fail indication adheres to standard FTIR methods
- Multi-range measurement with automatic range switching
- Recalculation of all data for interferences or new gases

Logging

- Separate Test Log for ease of data saving
- Separate Zero and Span Log for ease of data saving
- All spectra are saved with sampling information – temperature, pressure, auxiliary sensor readings, resolution for traceability
- Built in tests for:
  - Lower Detection Limit
  - Repeatability
  - Drift
  - Response Time

Automation

- Internal zero purge valve
- Sequence programing for multipoint measurement and automate span gas checks, purges etc.
- Full span gas audit within software – gas names, concentrations, certificate numbers
- Pump control
- Inputs from other devices and sensors

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}, or 4cm-1 (variable via software)	
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: 40°C or 60°C	
On-board Sampling system	Pre-cell filter for extra protection against dust Automated Zero Purge valve, with flow control Mass Flow Control for dilution and/or analyte spiking	Alarm relays Sample Signal Output 4-20mA outputs (optional)
Flow Rate	~2 lpm	
Dimensions	525 x 500 x 220. Clip-on trolley for transport	
Weight	<20kg, depending on options	
Supply	100 - 250 V / 50-60 Hz	

Measurement accuracy for atmosFIR

atmosFIR runs a Standard Analysis Model with fixed acquisition parameters and chemometric analysis for common 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	20secs T90 direct		
Short-term drift	<2% range		
Ambient temperature drift	<2% range		
Linearity (lack-of-fit)	<2% range	Repeatability (σ)	<1% range
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 (utilising external flow input) Flux calculations available as option.		

Supplier: