

# atmosFIR CEM

## Continuous Emission Monitoring (CEMS/AMS) Process Analyser

### Advanced Continuous Emissions Monitoring System (CEMS)

atmosFIR CEM is a complete Continuous Emissions Monitoring System (CEMS) incorporating the atmosFIR 19" rack mounted FTIR analyser. Providing a hot and wet emissions measurement, atmosFIR CEM is ideal for monitoring of multiple gases from applications such as incineration and power. A standard gas suite of **CO, NO, NO<sub>2</sub>, N<sub>2</sub>O, SO<sub>2</sub>, NH<sub>3</sub>, HCl, HF, CH<sub>4</sub>, O<sub>2</sub>, CO<sub>2</sub> and H<sub>2</sub>O** and more is provided, but with the powerful FTIR analyser, further gases can be added easily in software. This feature gives the ability to cost effectively meet future emission requirements.

At the heart of system is the 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 advancements in technology. The atmosFIR FTIR analyser contains an in-built sampling system and is designed for ppm-level emissions monitoring.

For emissions applications, atmosFIR CEM contains management of the heated sampling system from within the system – heated lines, probes – as well as comprehensive span gas options, including 6 span valves that can be used to calibrate the analyser directly or "span to probe", depending on the local Regulatory Authority's protocols.

Protea's PAS-Pro operating software not only collects and analyses the infrared spectra with the latest in analytical algorithms (**with no limit on the number of gases that can be measured**) but also manages the complete automation of the system. Modbus Serial, Modbus TCP/IP and OPC Server data exchange is provided as standard, and the monitoring results are reported both Raw and Corrected in real-time.

### Approvals

Meets requirements of EN 15267-3, QAL1 and EN14181.

Meets requirements of US EPA 40cfr Part 60 & 75

atmosFIR CEM is a complete multigas analyser system using FTIR technology.

- \* Waste Incineration Emissions monitoring
- \* Combustion emissions from power generation
- \* Core FTIR module available for integration
- \* Meets the requirements of EN 15267-3, QAL1 and EN14181.



## Measurements for atmosFIR CEM

atmosFIR CEM has at its core the atmosFIR FTIR gas analyser set-up for any number of different process or emissions applications. Contact Protea for specific gas analysis requirements. The standard incineration emissions application includes the following gases and ranges, however the system can be supplied to meet our customers' application.

Typical Response Time	<200secs at 1cm-1 resolution. (T90)	Accuracy	±2% FSD	Linearity	<2% range
Repeatability (σ)	<1% range	Drift (zero)	<±2% FSD 24hr non-cumulative	Drift (span)	<±2% FSD 24hr non-cumulative

## Standard Combustion Emissions Model

Gas	**Ranges				*LDL		Gas	**Ranges				*LDL	
	mg/m3	ppm	mg/m3	ppm	mg/m3	ppm		mg/m3	ppm	mg/m3	ppm	mg/m3	ppm
CO	0 – 75	0 – 60	0 – 300	0 – 300	0.6	0.5	CH4 (Methane)	0 – 15	0 – 21	0 – 1000	0 – 1400	0.1	0.1
NO	0 – 105	0 – 79	0 – 200	0 – 150	1.0	0.7	C2H6 (Ethane)	0 – 50	0 – 37	0 – 1000	0 – 740	0.1	0.1
NO2	0 – 80	0 – 40	0 – 200	0 – 100	0.6	0.3	C3H8 (Propane)	0 – 50	0 – 26	0 – 1000	0 – 510	0.8	0.4
N2O	0 – 50	0 – 25	0 – 400	0 – 200	0.4	0.2	C2H4 (Ethene)	0 – 50	0 – 40	0 – 1000	0 – 800	0.4	0.3
SO2	0 – 75	0 – 26	0 – 300	0 – 105	0.6	0.2	HCHO (Formaldehyde)	0 – 20	0 – 15	0 – 100	0 – 75	0.2	0.1
NH3	0 – 15	0 – 20	0 – 50	0 – 66	0.1	0.1	TOC (Indication only)	0 – 50		0 – 1000		-	
HCl	0 – 15	0 – 9	0 – 100	0 – 60	0.2	0.1	H2O		0-40%			0.02%	
HF	0 – 15	0 – 17	0 – 50	0 – 56	0.1	0.1	CO2		0-20%			0.005%	

\* LDL – Lower detection Limit (LDL)

\*\* Second Range on MCERTS gases is Supplementary Range. Normally gases can be monitored to % levels

Feature	
Variable Resolution FTIR Analysis	High resolution for complex identification, low resolution for speed of measurement
Field Update Capability	Gases monitored and reported can be added with software update
Wet or Dry Reporting	Gas concentration can be reported on a Wet or Dry Basis, operator selectable
Oxygen or H2O Normalisation	Monitored ranges can be reported normalised in accordance with Regulatory Authority Requirements
Low Maintenance VCSEL Reference	Reduced cost of ownership compared to HeNe laser method
Spectrum Retrieval	Spectra can be retrieved and analysed enabling undeclared gases to be identified
Oxygen Measurement	Reduces cost of full Monitoring System
Automatic Zero and Calibration Verification	No requirement for operator intervention during routine operation
EX Hazardous Area Option	Can be installed in hazardous areas Zone 1 or Zone 2 compliant cabinet (Consult factory)
Advanced Analysis	No limit to number of gases that can be measured via multigas analysis of full IR spectrum
Built-in Dilution and Linearity Check	Mass Flow Controller allows for dynamic spiking of sample, sample dilution and/or linearity checks

## System Specifications

### atmosFIR Continuous Emission Monitoring System

Spectral Range:	1.2 $\mu$ m - 20 $\mu$ m (485 - 8500cm <sup>-1</sup> )	
Resolution:	Variable resolutions. 1cm <sup>-1</sup> for standard emissions monitoring (0.7cm <sup>-1</sup> best). 2, 4, 8 cm <sup>-1</sup> all available with no hardware change needed	
Accuracy:	±2% FSD of range	
Cross-sensitivity	Minimal - PAS-Pro operating software analyses the infrared spectra using the latest in analytical algorithms minimising cross-sensitivity	
Response Time, T90:	Application and Gas Dependant. Meets ≤ 200 seconds for EN 15267-3 performance. T90 < 100 seconds achievable on specific applications.	
Source:	Mid-IR source, with electronic stabilisation for long lifespan	
Detector:	DTGS with signal sampling at 24-bit ADC	
Optics:	Zinc Selenide beam splitter (non-hygroscopic)	
Reference Laser:	Solid state laser (no scheduled maintenance required). Long lifespan (10 years) compared with HeNe laser	
Operating Environment:	Operating temperature range +5°C to +40°C (+41°F to +104°F) Optional Analyser Cooling / Heating for greater temperature range	
Sample Cell:	Materials: Ni-coated Al cell. Proprietary alloy mirror substrate with multi-layer coating. Volume: 300ml	
	Pathlength: 4.2m standard. Temperature: 180°C (356°F)	
Sampling system:	Heated pre-cell filter for extra protection against dust for the Zirconia oxygen sensor used for parallel O2 measurement. Automated Nitrogen Purge Valve	
System Enclosure	Dimensions:	Approx. 1800(h) x 600(w) x 800(d) plus 100mm plinth for installation
	Weight:	250kg
	Material:	Mild Steel
	Finish:	RAL 7035 structured powder coating with EMC gasket
Services Required	System Power :	1.5kW Max. Heated sample line 100W/m. Probe powered locally at stack
	Probe Power:	400W
	Instrument Air	Eductor 4 bar(g) continuous dry, oil and particle free Automatic zero 0.5 bar (g) 3l/min typically 7 minutes every 24 hours.
	Span Gases	Automatic Span Verification 1 bar(g) 3l/min for system checking
System Outputs	Analogue Outputs:	16 x 4-20mA (additional output card needed)
	Analogue Inputs:	5 x 4-20mA
	Digital:	Modbus Serial, Modbus TCP/IP and OPC Server data (all as standard)

### atmosFIR CEM Sampling Specifications

Sampling Rate	2.5lpm, controlled by venturi orifice
Sample Control	Heated eductor post-FTIR
Sample Line	4/6mm PTFE core heated to 180°C. Sample line temperature alarm
Sample Probe	2 $\mu$ m PTFE filter heated to 180°C. Sample probe temperature alarm
Span Gases	7 span gas valves, assignable to various gases and concentration levels. Also dedicated blow-back purge output
Span Gas Delivery	"Direct" to analyser or "Span to Probe" selectable

## PAS-Pro Software

PAS-Pro's advanced chemometric methods not only calculate, display and transmit concentrations of monitored gases, but also runs diagnostics ensuring the system is operating within specification. Gas concentrations are accurately monitored and displayed on the engineer-friendly interface, with no need for complex set-up of the FTIR being done in the field. In addition the system controls Autozero & Calibration verification routines ensuring local Regulatory Authority compliance.



Features include:

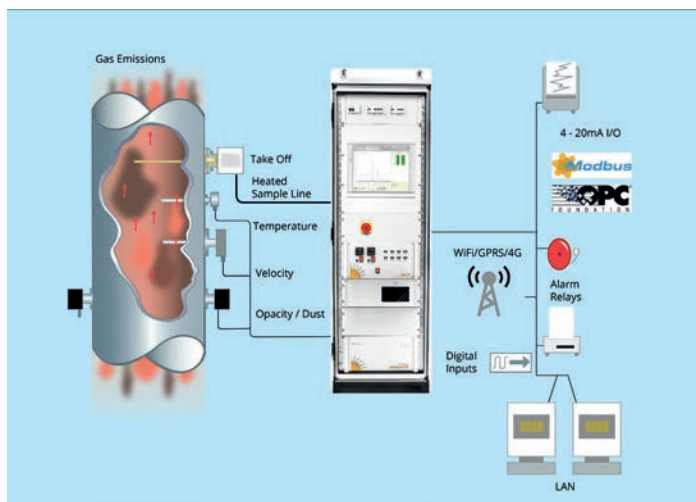
- \* Touchscreen user friendly interface
- \* Gas specific analysis
- \* No limit to number of gases to be monitored
- \* Variable automatic range switching
- \* Automatic or manual Zero/Calibration (Up to 7 span valves)
- \* External Zero/Calibration function
- \* On-screen alarm and audit messages
- \* Calibration file can be saved and sent electronically
- \* Multi-stream (Up to 32 points)
- \* Eductor / Pump control
- \* Heated line and probe alarms
- \* Industry standard outputs

## Fully Integrated CEMS

The atmosFTIR can be supplied with third party Stack Temperature, Velocity and Particulate devices enabling the system not only to report monitored values but also calculate and display gases in mass emissions such as mg/hr, g/hr, kg/hr.

The monitored concentrations and associated data can be transmitted to the plant DCS utilising standard industrial formats.

The system can be supplied with a CEM Data Acquisition System (DAS) – The system is compliant with the requirements of US EPA and certified to EN14181.



## Protea Distribution

Protea operate a worldwide distributor and customer support network guaranteeing that our customers receive outstanding support both before and after sale. All our distributors have factory trained service engineers to support our products.



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