

Protea 2000 In-Situ CEMS

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



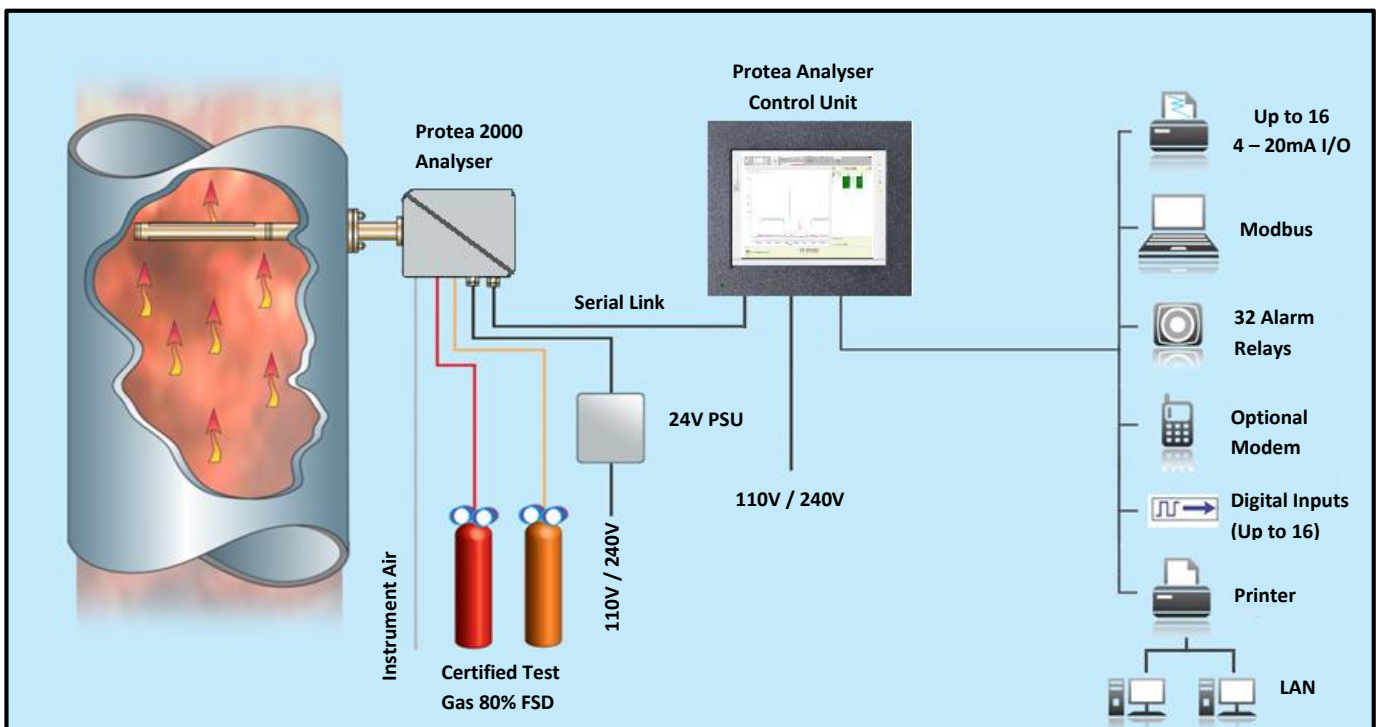
In-Situ Continuous Emissions Monitoring System (CEMS)

Protea 2000 is an infra-red (IR), duct or stack-mounted Analyser, designed to provide In-Situ analysis of up to six gas-phase emission components.

A typical system comprises of a stack mounted Analyser, an integral Calibration Module and a Control Unit with options which include a powerful In-Situ Heater and a stand-alone Analysis Software package.

Protea 2000 uses the reflective beam principal to directly measure process gas as it enters the in-situ sample cell. Unlike higher maintenance extractive systems, Protea's sintered metal technology removes the need for gas filtering or sample conditioning.

The Protea 2000 analyser requires very little maintenance and achieves a class-beating availability of over 98% in demanding applications.



Analysers: The Protea 2000 analyser operates on the proven, single beam, dual-wavelength IR principle. Mid IR Pulses, at two specific wavelengths per monitored component, are transmitted through the sample cell. The 'measure' pulse is partially absorbed by the gases being measured while the 'reference' pulse remains unaffected. Up to eight wavelengths are available, sometimes sharing reference wavelengths, allowing up to six gas-phase component concentrations to be monitored simultaneously.

Auto Verification: Uniquely, the operation, zero and calibration are "fully challenged" in that all operating modes use the same optical path and system components. The integral Auto Verification Unit provides a zero-check on the system by filling the sample probe with clean, dry instrument air. Similarly, it performs a span-check by filling the sample probe with certified span gas.

Applications: The Protea 2000 analyser is an ideal CEMS for demanding application with a proven record of reliability.

For example:-

- Power Generation
- Cement
- Incineration
- Marine
- Refineries
- Pulp & Paper
- Chemical
- Glass
- Steel
- Nitric Acid Plant
- Fertiliser Plant

Features

- Multi-component gas analysis
- Direct in-situ measurements
- Wet or Dry readings
- Automatic signal verification and recalibration
- Oxygen or CO₂ measurement normalisation (option)
- Single Flange mounted analyser
- Low maintenance

Benefits

- Each Protea 2000 can measure up to six gas species
- No requirement for high cost, high maintenance sample handling system or sample conditioning
- Can inherently report on Wet or Dry gas basis
- No operator intervention during routine use
- Report measurement corrected to normalised O₂ or CO₂ reference conditions
- Reduced cost and simplicity of installation
- Reduced cost of ownership

Examples of Monitoring Ranges

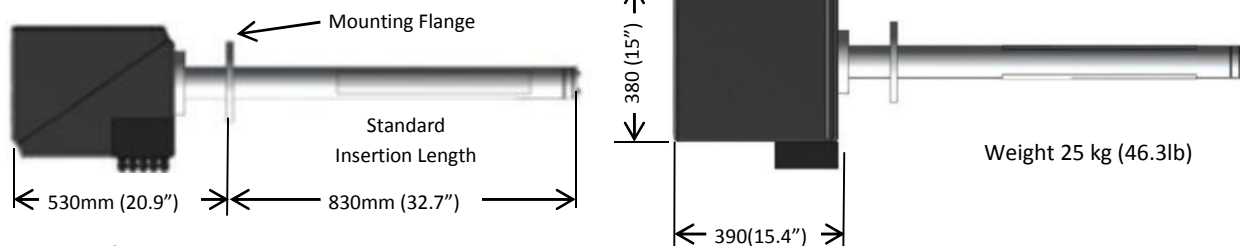
| Principle of operation: | Single Beam Dual Wavelength Infra-Red with GFC where advantageous | | |
|-------------------------|---|------------------|---------|
| Gases measured: | Up to 6 hetero-atomic molecular gases as determined by the application. | | |
| CO | 0 - 150ppm / 188mg/Nm ³ | CO ₂ | 0 - 15% |
| SO ₂ | 0 - 150ppm / 429mg/Nm ³ | H ₂ O | 0 - 12% |
| NO | 0 - 240ppm / 322mg/Nm ³ | | |

System Specifications

Protea 2000 Continuous Emission Monitoring System

| | | |
|-----------------------------------|---|--|
| Spectral Range: | Specific application dependent wavelengths (up to 8) are selected between 2-12 µm | |
| Accuracy: | ±2% FSD of range | |
| Cross-sensitivity | Minimal – Utilising Gas Filter Correlation and latest in analytical algorithms minimising cross-sensitivity | |
| Response Time: | Application Dependant ≤ 120 seconds to T90 | |
| Source: | Low wattage enclosed nichrome filament long life source, | |
| Detector: | Pyroelectric | |
| Optics: | Calcium fluoride (CaF ₂) | |
| Operating Environment: | Operating temperature range -20°C to +55°C (-4°F to +130°F) Optional Analyser Cooling / Heating for greater temperature range | |
| Sample Temperature: | Up to 350°C (660°F) (higher temperatures on application) | |
| Materials-contact with gas: | Calcium Fluoride, Glass, 316 Stainless Steel, Graphite | |
| Sample Cell Path length: | 1 metre | |
| Enclosure: | Aluminium alloy casting with high protection finish, protected to IP65 (NEMA 4X) | |
| Interconnection: | twisted-pair cores with individual screen typically allows up to 1000m separation between Analyser and Control Unit | |
| Services Required: | System Power : | Power for analyser with PSU 115V/230V 175W |
| | Probe Power: | Power for in situ heater (optional) 115V/230V 1kW |
| | Instrument Air: | Instrument air for the analyser void purge, auto zero and sample cell protection, controlled by the analyser. 2 barG: flow rate 0.5 litre/min constant and 6 litre/min intermittent during Auto-zero |
| | Span Gases: | Automatic or Manual Span Verification 1 bar(g) 6 litre/min (Optional) |
| Analyser Inputs: | Analogue Inputs: | 3 x 4-20mA |
| | System Outputs from Control Unit: | |
| System Outputs from Control Unit: | Analogue Outputs: | 16 x 4 -20mA |
| | Digital: | Modbus Serial, Modbus TCP/IP and OPC Server data |

Analysers Dimensions



Accessories

Optional accessories are available to extend the analyser's capability in cases of extreme process or ambient variations. Typical examples would be a probe heater to ensure the in situ gas cell operates above process gas dew point, a gas flow bypass for high sample applications analyser for operation in high ambient temperature conditions.

Approvals

The Protea 2000 system is designed to meet the requirements of both customers and environmental authorities worldwide. The system enables rapid upgrades with regard to measuring range, presentation and reporting format, thus ensuring compliance with reporting criteria such as US EPA 40 CFR part 60 & 75 legislation. The system calculates errors due to drift in Zero and Span gas calibration suitable for use as input data to external EN14181 QAL 3 reports.

Control Unit Software

The software application uses advanced chemometric methods not only to calculate, display and transmit concentration of monitored gases but also runs diagnostics ensuring the system is operating within specification. Gas concentrations are accurately monitored using Protea's algorithms. In addition the system controls Autozero & Calibration verification routines ensuring local Environmental Agency compliance.



Analysers Control Unit

The data logging and control system is Microsoft Windows based. The system is capable of controlling up to six, widely dispersed, Protea analysers of any design. The Analyser Control Unit is also designed to accept signal I/O from other instruments in the process to provide a single CEMS data hub. The system displays gas concentrations and third party analyser I/O along with information on sample conditions, diagnostic data and trends. The information can also be made available to external devices in a variety of industry standard data protocols.

Features include:-

- Touchscreen user friendly interface
- Gas specific analysis
- Up to six gases monitored simultaneously
- Automatic range switching
- Automatic or manual Zero/Calibration
- External Zero/Calibration function
- On-screen alarm and audit messages
- Industry standard outputs

Fully Integrated CEMS

The Protea 2000 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 units such as 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 Systems (DAS)** – The system is compliant with the requirements of US EPA and certified to EN14181

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