

P2000D

Continuous Emission Monitoring (CEMS/AMS) Process Analyser



Overview

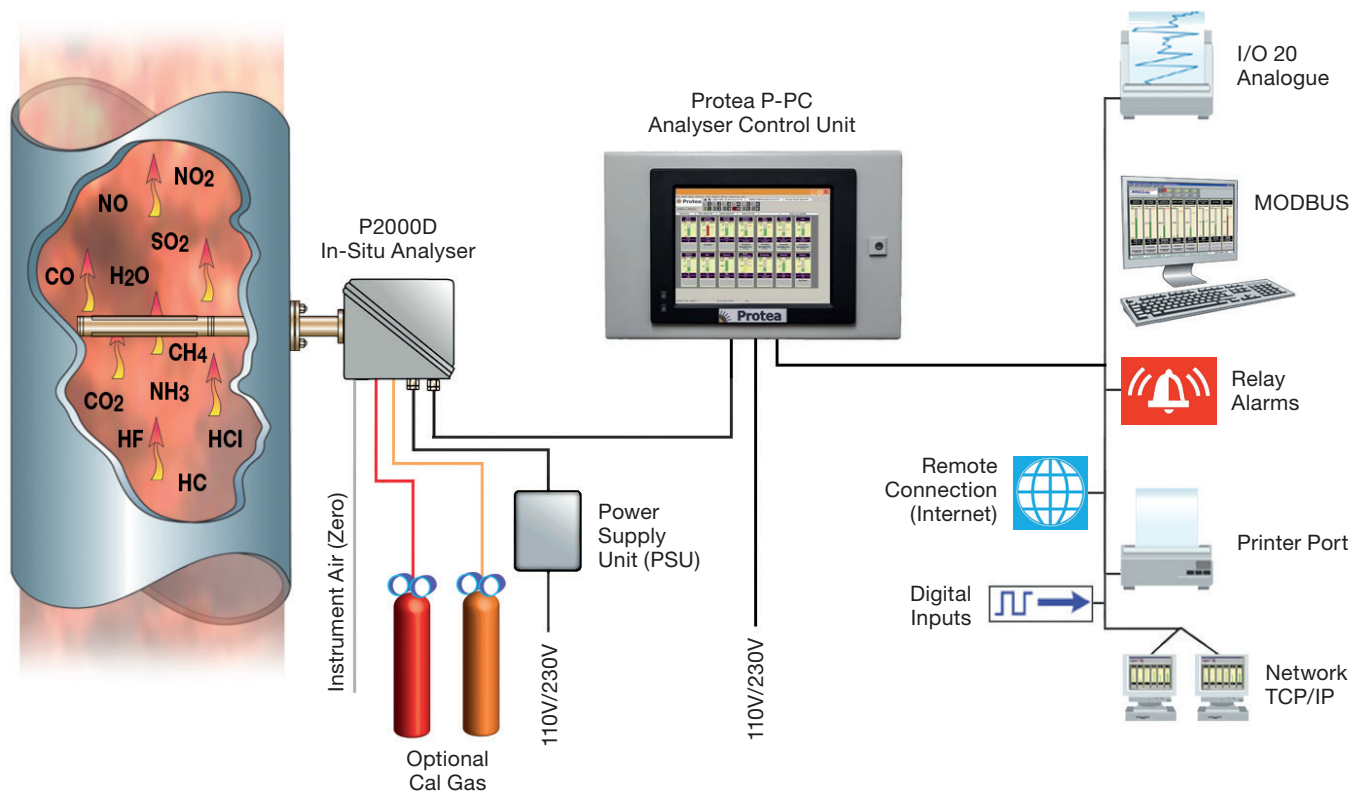
P2000D is an combined infra-red (IR) and Ultra Violet (UV), duct or stack-mounted Analyser, designed to provide In-Situ analysis of up to eight gas-phase emission components. A typical system comprises of a stack mounted Analyser, an integral Calibration Module and a Control Unit with options which include a powerful In-Situ Heater and a stand-alone Analysis Software package.

P2000D 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 patented, sintered metal technology removes the need for gas filtering or sample conditioning.

The P2000D analyser requires very little maintenance and achieves class-beating availability of over 98% in demanding applications.

The Control Unit can support multiple analysers from the Protea range.



Principles of Operation

P2000D Analytical Techniques

The majority of pollutant gases can be monitored in the Infra Red (IR) however in some cases it is beneficial to monitor in the Ultra Violet (UV), in particular low concentrations of SO₂ & NO₂ in the presence of high level of water vapour.

P2000D – Infra Red (IR)

The Infra Red (IR) measurement operates on the dual-wavelength single beam principle. 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 concentrations to be monitored.

P2000D-UV – Ultra Violet (UV)

The Ultra Violet (UV) measurement operates on the single-wavelength dual beam principle. UV Pulses, at a specific wavelengths per monitored component are sequentially transmitted through the sample cell (measure pulse) then directly to the detector (reference pulse). The 'measure' pulse is partially absorbed by the gases being measured while the 'reference' pulse remains unaffected. By comparing the pulses the gas concentration can be calculated. Two wavelengths are available allowing two gases to be monitored.

Verification

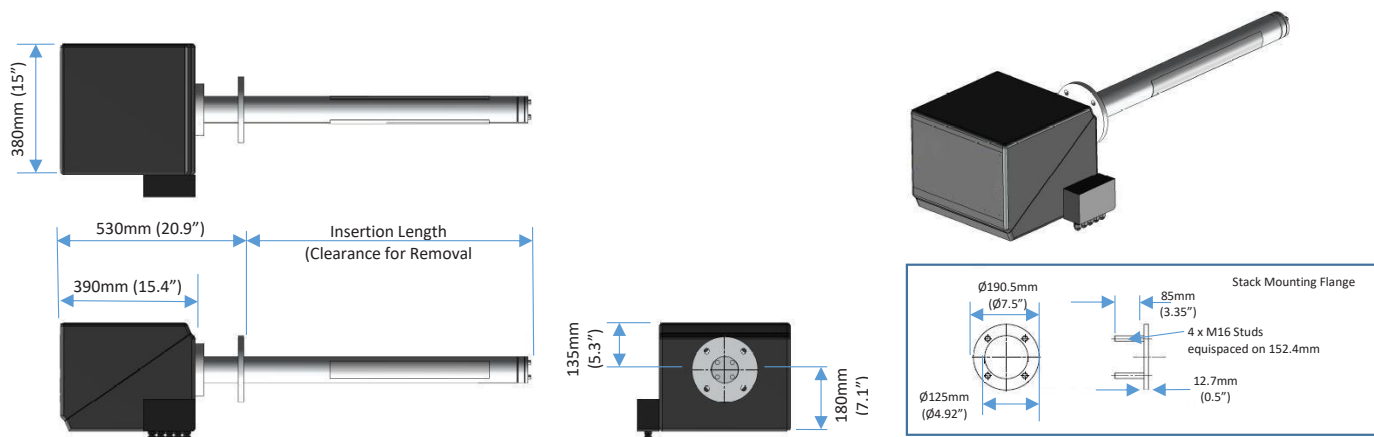
The system includes an integral Auto Verification Unit. This is programmed to deliver a sample of clean, dry instrument air to the sample cell in order for an automatic zero-check. Similarly, manually or automatically at a preset interval, a span check is conducted by filling the sample probe with composite certified span gas. The zero and span checks fully challenge the operational system as they are applied to the sample cell that is used in normal operation.

Features	Benefits
Multi-component gas analysis	Each P2000D can measure up to six component
Direct in-situ measurements	No requirement for high cost, high maintenance sample handling system or sample conditioning
Wet or dry readings	Can inherently report on Wet or Dry gas basis
Automatic signal verification and recalibration	No operator intervention during routine use
Oxygen (O ₂) or (CO ₂) measurement normalisation (option)	Report monitored concentrations normalised to O ₂ or CO ₂ reference conditions
Single Flange mounted analyser	Reduced cost and simplicity of installation
Low maintenance	Reduced cost of ownership
	Suitable for marine applications

Example of gases to be monitored

Gas	Infra Red Ranges		Ultra Violet Ranges	
Carbon Monoxide CO	0 – 187 mg/m ³	0 – 150 ppm		
Nitric Oxide NO	0 – 320 mg/m ³	0 – 240 ppm		
Nitrogen Dioxide NO ₂	0 – 410 mg/m ³	0 – 200 ppm	0 – 62 mg/m ³	0 – 30 ppm
Nitrous Oxide N ₂ O	0 – 590 mg/m ³	0 – 300 ppm		
Sulphur Dioxide SO ₂	0 – 430 mg/m ³	0 – 150 ppm	0 – 86 mg/m ³	0 – 30 ppm
Water in Gases H ₂ O _(g)	0 – 30%			
Carbon Dioxide CO ₂	0 – 15%			

For other gases and ranges please see Protea Photometer Ranges 19-6A0808.



Control Unit Options

Analyser Control Unit – Protea P-PC

The Protea P-PC 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 Protea P-PC range is also designed to accept signal I/O from other instruments in the

process to provide a single CEMS data hub. The Protea P-PC 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.



Specification

Infra-red spectral range:	Specific application dependent wavelengths (up to 8) are selected between 2-12 μm .
Infra-red source:	Enclosed nichrome filament.
Infra-red detector:	Solid state pyroelectric element.
Ultra Violet source:	Dual Deep Ultra Violet Light Emitting Diode.
Ultra Violet detector:	UV Photo diode Concentrator lens.
Sample path length:	1 metre.
Sample temperature:	Up to 350°C (660°F). Optional higher temperatures up to 800°C (1742°F).
Cross-sensitivity:	Minimal due to the wavelength selection and advanced algorithms in the processor software.
Accuracy:	Typically $\pm 2\%$ of full scale concentration but dependent on application.
Response time:	Application dependent but typically 120 seconds to T90.
Enclosure:	Aluminium alloy casting with high protection finish, protected to IP65 (NEMA 4X).
Operating environment:	Operating temperature range -20°C to 55°C (-4°F to 130°F). Optional Analyser Cooler/Heater for greater temperature range.
Materials-contact with gas:	Calcium Fluoride, Glass, 316 Stainless Steel, Graphite.
Services required:	Power for analyser with PSU 115V/230V 175W. Power for in situ heater (optional) 115V/230V 1kW. 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 (typically 8 minutes every 12 hours).
Interconnection cable:	2 twisted-pair cores with individual screen typically allows up to 1000m separation between Analyser and Protea Analyser Control Unit.
Weight:	25 kg (46.3lb).
Physical dimensions:	Analyser 1360mm (53.5") x 380mm (15") x 315mm (12.4").

Optional Components

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, and a gas flow bypass for operation in high ambient temperature conditions. Further details of these and many other accessories are available at www.protea.ltd.uk or on the accessories data sheet.

Approvals

Continuous Emissions Monitoring

CEM – US EPA 40 CFR part 60 & 75

The P2000D 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 reports.



This Datasheet is a guide to the product and Protea Ltd reserve the right to modify the product without notification.