



UltraCEM

Outdoor Field Mount
Continuous Emissions
Monitoring System

Outdoor Field Mount

The Tyco UltraCEM system is a Field Mount Continuous Emissions Monitoring System that uses proven extractive monitoring technology, is coupled with state of the art measurement detectors and utilises a semi-conductor industry standard PC104 electronics platform for maximum measurement, communications and processing capabilities.

The UltraCEM is designed to extract a sample gas, condition the sample, analyse for the desired constituents, and process the emission data by utilising the required calibration validation calculations/procedures and O₂ diluent corrections as stipulated in 40 CFR Part 60 regulations. The UltraCEM system is also a Data Acquisition system that will store relevant raw/diluent corrected emissions, flags, calibrations and alarms for a period of three months.

Product Description

- Five channel multi measurement emission capability
- Field Mount NEMA 4X Box construction designed for Outdoor monitoring: High cost shelter not required
- Easy to service front access components
- Time proven high Accuracy/Sensitivity gas detectors utilised: Paramagnetic (O₂), GFC-IR (CO and CO₂), Chemiluminescent (NO_x), GFC-UV (SO₂), FID (THC)
- All Computer parts are industry Format PC104 for easy upgrades or replacements
- Ultra Flexible Pocket PC display/keypad - Optional wireless transmission
- HTML "web-browser" operator interface provides user display and interface from anywhere in the world via the world wide web
- Built in Data Acquisition and System Handling System - 40 CFR Part 60/75 compliant***
- Independent Analysis and Sample conditioning panels allow maximum installation flexibility
- Heated Sample Line not required
- Industry standard robust sample conditioning components
- Optional Hazardous area Class I, Div. II option

*** Does not include Reporting. Emission reports as specified in the customers particular State or Federal regulations shall be configured and submitted by the customer.



Sample Conditioning/Probe Box

The sample gas is extracted by a specially designed probe and is then conditioned by utilising the UltraCEM sample conditioning/Probe Box. The box is located at the sampling location and consists of the following equipment.

Housing

The housing is completely piped and wired and is accessible to customer via bulkhead and terminal block termination points.

All sample lines, fittings and valving are Stainless Steel, Teflon and Polypropylene.

The housing is also equipped with a state of the art Thermo Electric Air Conditioner. The Thermo Electric air conditioner is a compressor-less type and does not require periodic maintenance. The unit will both heat and cool which will allow the sample conditioning/probe box to operate in any hot to cold environments.

Cleaning

The gas sample is cleaned with two levels of filtration: Primary filtration is performed at the probe tip by utilising a 0.5 micron sintered filter. Secondary filtration occurs after the sample pump.

Sample Drying

The UltraCEM provides a dry basis gas measurement. The reason is most regulatory agencies require measurements to be recorded as dry.

The UltraCEM dries the sample gas by utilising a dual pass thermo electric chiller. The chiller cools the sample gas and is allowed to continue through the system. The sample is then passed through a membrane-type high efficiency permeation dryer that will dry the sample to a minus 30°C dew point. This extreme drying process eliminates the requirement for heated sample line.

Sample Pump

The pump is a positive displacement type pump that uses a moving diaphragm. All wetted parts are 316 Stainless Steel and Teflon. In normal operation the pressure at the pump outlet is set between 5 -10 psi.

Back Pressure Regulator

The BPR is used to vent the sample gas flow that is in excess of that needed for analysis. This approach yields both minimum response time and higher analysis stability because of steady sample pressure.

Vents and Drains

All vented gases or drained fluids are vented through bulkhead unions. Customer may route them to a sump. If the housing is located in a well-ventilated area, the gases can be vented to the atmosphere.

Wiring

All termination points for incoming or outgoing signals are provided on terminal strips or plugs.

Probe

A specially designed probe extracts sample gas from the stack. The probe is constructed of 316 Stainless Steel.

The probe tip is fitted with a sintered filter and the filter can be easily changed and serviced.

Calibration fittings are provided so that system complies with EPA guidelines for auto calibration as outlined in US EPA 40 CFR Part 60 regulations. Tyco provides solenoid operated valve for auto blowback of probe.

The customer must provide the instrument air supply. The sample probe has optional 4" and 6" flange adaptors available and is available in a variety of probe lengths.

Measurement Analysis System

The UltraCEM design includes an Analysis box which accommodates all of the measurement detectors and computer components. The box can be located at the sampling location or up to 300' away from the sample handling box for user installation flexibility. This enclosure is rated NEMA 4X and can be mounted directly in the outside environment. Sun and rain shields are mandatory to maintain proper performance specifications.



O₂ Detector (Paramagnetic)

The determination of oxygen is based on the measurement of the magnetic susceptibility of the sample gas. Oxygen is strongly paramagnetic, while other common gases are not.

The detector used is compact, has fast response and a wide dynamic range. The long life cell is corrosion resistant and may be easily cleaned. It has rugged self-tensioning suspension and is of welded Non-Glued construction. Standard range is 0-25%.

CO and CO₂ Detectors (NDIR-GFC)

The non-dispersive infrared method (Single beam double wave) is based on the principle of absorption of infrared radiation by the sample gas being measured. The gas specific wavelengths of the absorption bands characterise the type of gas while the strength of the absorption gives a measure of the concentration of the gas component being measured.

A pair of gas filled cuvettes are mounted on a rotating disc. The reference cuvette is filled with a sample of the gas to be measured and the measure cuvette with nitrogen. This technique is known as gas filter correlation. They pass through the beam of light alternately.

The difference in absorbance is measured by the detector and provides a direct output of the gas concentration.

Standard dual range capability between 100-1000ppm is adjustable by user.

NOx (Chemiluninescent)

The NOx detector consists of an ozone generator, chemiluminescence reaction chamber and a photomultiplier tube detector. The reaction chamber operates at atmospheric pressure, thus eliminating the need for the bulky vacuum pump found in other chemiluminescent instruments. The reaction between Ozone and Nitric Oxide is used to determine the presence of Oxides of Nitrogen (NOx) in a sample gas. Nitric Oxide and Ozone readily react to form nitrogen dioxide in a electrically excited state. The excited NO₂ immediately reverts to the ground state, emitting photons.

The light intensity is measured by the peltier controlled photomultiplier tube detector. Standard dual range capability between 5 - 1000ppm is adjustable by user.

SO₂ Detector (UV-GFC)

The absorption measurement in the UV spectral range is based on the same principle as the IRGFC measurement. The standard range capability is between 50 to 2000 ppm and is adjustable by user.

Automatic Calibration

To minimise the effect of long term zero and span drift in each analyser detector, the PC104 system controller periodically initiates a calibration cycle as specified by the user. This feature assures reliable, accurate data while minimising the attention required by operating personnel. At adjustable intervals, the microprocessor will energise the appropriate valves which cause first zero, mid and then span gas to flow through each analyser.

When the analyser readings stabilise, the PC Contoller calculates the zero and span drift value for each detector. If a significant measurement deviation from the standard gas value exists, an alarm is generated which must be reset.

PC104 system Controller/Data Acquisition System

The PC104 controller is a standard off the shelf PC based platform and will perform all hardware control, as well as provide select data processing capability for the UltraCEM.

Both analog and digital inputs and outputs are provided, including data correction and average values. The PC104 system:

- Provides all automatic and manual functions.
- Automatically calibrates each gas analyser at selected time intervals to ensure accuracy and regulatory compliance.



- Automatically controls backpurge of sample probe with instrument air.
- Provides system limit and failure alarms.
- Provides I/O digital and analog signal interfaces.
- Applies calibration correction factor for each analyser output, data averaging for regulatory requirements (3 months data storage of 15 minute and 1 hour averages, 1 week storage of 1 minute averages),
- Applies O₂ diluent correction and stores data as separate value.
- Has Standard Ethernet port for HTTP Web browser viewing/internet Data Download capability.
- Can access the menu and data from anywhere in the world from any PC via the internet.
- Has RS232, RS485 or Ethernet links utilising state of the art TCP/IP communications capabilities.
- Uses an Intel Pentium processor with 64 MB RAM and 128 MB DRAM: Printer Port, Keypad Port and Monitor Port.
- Provides single button initiate to download data into excel format. Simple regulatory reports can then be tailored by the user.

Note: The UltraCEM's PC system controller does not provide a reports generator therefore it is the responsibility of the customer to construct and submit any state or Federal EPA required reports.

The PC will provide data for the following:

Pocket PC Display

The UltraCEM-PD Analysis Panel internally employs a standard, off the shelf, robust HP Pocket PC, which runs on Windows CE. The Pocket PC is very flexible and allows the user to easily scroll through menus and very easily view the data due to the very high-resolution display.



Wireless Option

As an option the Pocket PC can be equipped with a wireless communication transmission. The Pocket PC can simply be removed from the enclosure at any time and operated at distances of up to 1000' away from the analysis enclosure.

Sample and Calibration Gas Distribution

- The gas and calibration gas samples will be controlled by a single Mass Flow Controller. The MFC shall control the sample gas and calibration gas sample gas flow very accurately. The use of an MFC allows for very high accuracy and reliable monitoring.
- The Analysis Panel is equipped with a 3 way universal solenoid that will accommodate the gas sample for either the normal stack gas sample or direct the calibration gases directly to the analysers otherwise known as a local calibration.
- The UltraCEM is equipped with a manifold with four two-way Normally Closed solenoid valves that will direct the customer supplied calibration gases into the system. The three valves will be used for Zero, Mid and Span gas calibrations respectively.
- The panel is equipped with a gas vent line. The vent will be routed to a sump by customer. If the housing is located in a well ventilated area, the gases can be vented to the atmosphere. Otherwise they should be piped out of the room or building.
- A Back Pressure Regulator with a gauge will allow user to visually inspect for proper pressures. The BPR will also maintain constant 5 PSI of pressure to the gas detectors.
- The Chemiluminescent detector requires a continuous source of instrument air from customer. The enclosure is equipped with a bulkhead fitting for this connection.

Accurate Detector Temperature Control Box

All measurement detectors are located in a box design equipped with a compact and highly efficient environmentally sealed thermo electric controlled system. The enclosure is kept at a constant temperature (40°C +/-0.1) enabling the analyser to produce extremely accurate measurement results due to the fact that the temperature control is stable and at ideal temperature.

1 Year Ownership Cost Comparison

Item	1 Year Cost UltraCEM (US\$)	1 Year Cost Others (US\$)
UltraCEM Unit Cost:	UltraCEM (US\$)	Others (US\$)
O ₂ , NOx and CO	\$50,000	\$70,000
DAS cost (Part 60)	\$15,000	\$30,000
Shelter cost (8'D X 8'W X 8'H)	\$0	\$20,000
Annual shelter maintenance	\$0	\$5,000
Shelter installation	\$0	\$5,000
Peripheral installation costs	\$2,000	\$10,000
Heated Sample Line (250')	\$0	\$12,500
TOTALS	\$67,000	\$152,500
Savings PER UltraCEM =	\$85,500	

Equipment to be supplied by others

- Calibration gas bottles
- Calibration gas regulators. Dual stage with CGA connector
- Instrument Air supply
- 85-125 VAC, 50-60Hz plant power supply
- Tubing between probe and sample handling panel
- Wiring trays for electrical interconnection wiring
- Sample ports for probe connection
- Mounting Hardware



Measurement Analysis System Specifications

General

Power:	Universal Power Supply 85 - 125VAC, 50 - 60 Hz, + 10%, 500 Watts Maximum at Start Up. 250 Watts Nominal
MicroProcessor:	Intel Celeron processor, 566MHz, 64MB RAM, PC104 architecture, Windows NT embedded Platform
Pocket PC:	206MHz, StrongArm processor, 32MB RAM 32 ROM, 240 x 320 pixels LCD,TFT color, backlit, Wireless LAN optional
Detectors//Number:	NDIR-GFC (CO and CO ₂), UV-GFC (SO ₂), Paramagnetic (O ₂), Electrochemical (O ₂),Chemiluminscent (NOx), (THC) FID Up to five in one analyser
Mounting:	Wall Mount
Area Classification:	General Purpose
Compliance's:	CSA (Pending)
Ambient Temperature Range:	-30° to 50°C.
Relative Humidity:	99%

Inputs/Outputs:

Digital:	RS-485 Serial Port. (Multi-Drop Network) RS-232 Serial Port. LAN, Ethernet 10/100-BaseT
Connectivity Protocols:	HTML (Web Browser) - Status, file transfer Modem / Web browser TCP/IP, MTTTP ASCII String Microsoft Shared drive FTP Logs download TELNET Server
Analog:	Analog Outputs: 8 Isolated 4-20 mA dc, 500 ohms Max Load (O ₂ , CO, CO ₂ , SO ₂ , NOx and 3 spares) Analog Inputs: 4 (Typically; Flow, Opacity, MW, Fuel Flow)
Digital:	Outputs: 10 dry contact digital Outputs; maximum 110VAC @ 1 amp load. Typical; O ₂ , CO, CO ₂ , SO ₂ , and NOx limit exceed, data valid, in calibration, in maintenance, trouble alarm Digital Inputs: 10: (Typical Process on/off, Flame Detect, Shutdown or Initiate Cal, flow signals and Opacity signals). Interrogated with 5 VDC.
Instrument Weight:	60 lbs Typical
Size:	30" X 24" X 12" (H W D)
Ranges:	O ₂ : 0 -1 Selectable to 0 -25% (1% increments) CO: 0 -10 ppm Selectable to 100% (1 ppm increments) CO ₂ : 0 - 5 ppm Selectable to 100% (1 ppm/% increments) NOx: 0 - 5 ppm Selectable to 10,000 ppm (1 ppm increments) SO ₂ : 0 - 25 ppm Selectable to 2000 ppm (1 ppm increments) THC: 0 - 5 ppm Selectable to percent levels
Sample Temperature:	0°C to 55°C
Sample flow rate:	0.5 to 1.5 litres/min
Warm Up Time:	Max 25 minutes

Sample Handling Box and Probe Specifications

General

Power:	Universal Power Supply 85 - 125VAC, 50 - 60 Hz, + 10% 500 Watts Maximum at Start Up. 250 Watts Nominal
Mounting:	Wall Mount
Area Classification:	General Purpose
Compliance's:	CSA (Pending) Ambient Range Temperature: -300 to 500C
Relative Humidity:	99%
Instrument Weight:	80 lbs Typical
Size:	24" x 24" x 12" (H W D)
Stack Sample Moisture:	Up to 30% max
Sample Cooler:	Thermo Electric type with dual pass Chiller.
Max. Stack Temperature:	Standard 14000F
Stack Pressure:	Typical -5 to 15 inches H ² O
Sample Flow Rate:	500 to 2500cc/min
Response Time:	30 seconds/100' of Heated Sample line (1/4" tubing)
Probe Length:	48" length 316 Stainless Steel Probe with .5 micron sintered filter. Optional 5' and 6' probes.
Probe Mounting Flange:	Standard 4" 150# Raised Face (2 Hole Top). Shipped Equipped with Gasket
Sample Pump:	316 Stainless Steel diaphragm type
Instrument Air Requirements:	Instrument grade air required. 15 SCFM @ 60 -100 PSIG (30 seconds 2 times per day) Pressure Regulation by Customer

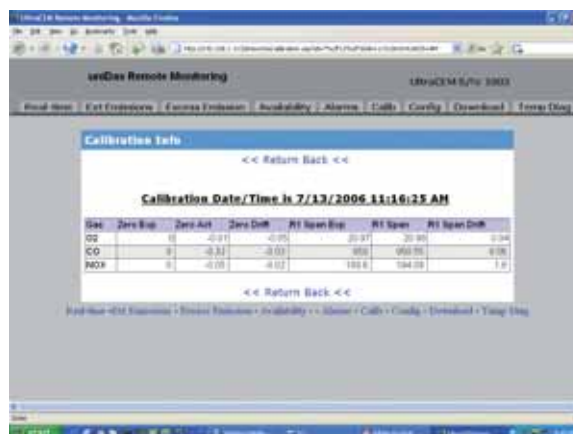
	Paramagnetic O ₂	NDUV SO ₂ /FID THC	NDIR CO/CO ₂	Chemiluminescent NOx
Linearity	< +/- 1%	< +/- 1%	< +/- 1%	< +/- 1% (1)
Zero Drift	< +/- 1% /day	< +/- 1% /day	< +/- 1% /day	< +/- 1% /day (1)
Span Drift	< +/- 1% /day	< +/- 1% /day	< +/- 1% /day	< +/- 1% /day (1)
Repeatability	< +/- 1%	< +/- 1%	< +/- 1%	< +/- 1%/day (1)
Response Time (t ₉₀)	10 < +/-t ₉₀ < +/-15	30 < +/-t ₉₀ < +/-45s	15s < +/-t ₉₀ < +/-30s	15s < +/-t ₉₀ < +/-30s
Influence of Ambient Temperature (-30°C to 50°C)				
- On Zero	< +/-1%	< +/-2%	< +/-2%	+/-2%
- On Span	< +/-1%	< +/-2%	< +/-2%	+/-2%

(1) 0-10 ppm NOx range is < +/-2%.

Sample Pocket PC Screens



Sample Menu Screens





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