



UltraCEM-PD
Indoor Panel/Wall Mount
Utilising Dilution Technology
Continuous Emissions
Monitoring System

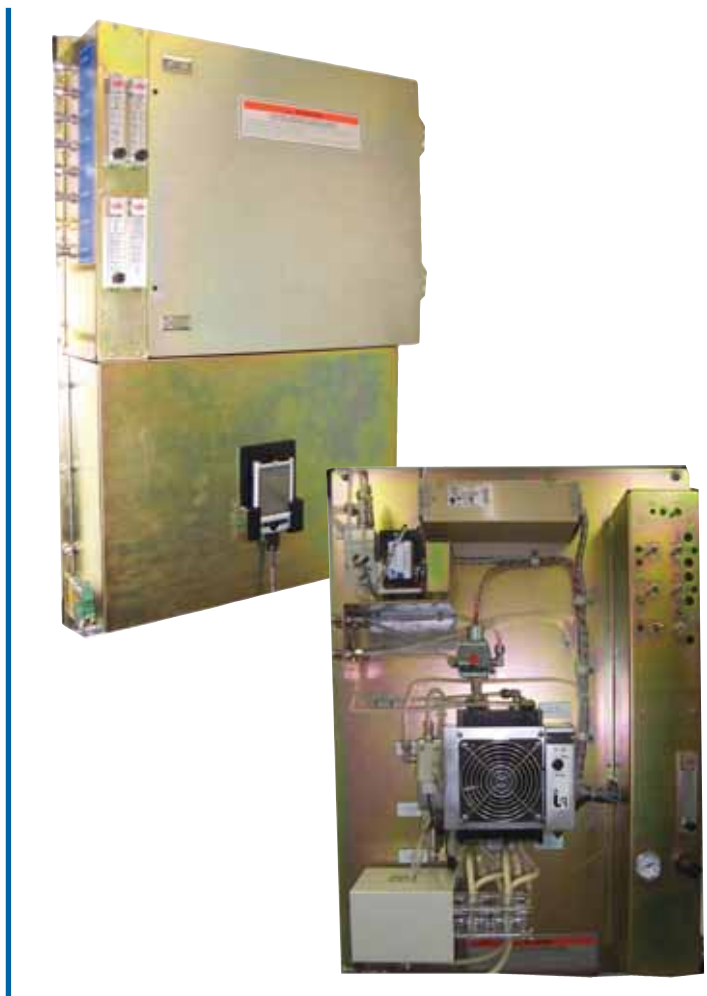
Indoor Panel/Wall Mount Utilising Dilution Type Technology

The Tyco UltraCEM-PD Panel Mount CEM System is a compact, powerful and cost effective, Dilution Type Continuous Emission Monitoring System. It utilises proven Dilution Monitoring Technology and is coupled with state of the art measurement detectors, utilising a semiconductor Industry Standard PC104 electronics platform for maximum measurement, communications and processing capabilities.

The UltraCEM-PD design extracts a sample gas at the probe location, Dilutes the gas sample, analyses it for the desired constituents, and processes the emission data utilising the required calibration validation calculations/procedures and CO₂ diluent corrections as stipulated in 40 CFR Part 60 or 75 regulations. The UltraCEM-PD system is also a Data Acquisition System that stores relevant raw/diluent corrected emissions, flags, calibrations and alarms for a period of 3 months.

Product Description

- Dilution Technology design offers equipment simplicity, reduced maintenance and the ability to monitor highly corrosive gas measurements on a wet measurement basis
- Ideal for EPA Part 75 Applications: Open Panel mount design reduces wall space allowing for smaller shelter/control room design options
- Easy to service front access components • Multi Channel Emission Monitoring System - from one to five channel measurements
- Time proven, High Accuracy/Sensitivity gas detectors utilised:
 - GFC-IR (CO and CO₂) FID (THC)
 - Chemiluminescent (NO_x)
 - GFC-UV (SO₂)
- 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
- Heated Dilution Probe with External Critical Orifice.



The UltraCEM-PD system consists of three major components:

- Dilution Probe (DP)
- Dilution Conditioning Unit (DCU)
- Measurement Analysis System (MAS)

Dilution Probe

The UltraCEM-PD's dilution probe assembly is located at the gas sample port and is equipped with a one meter pipe to extract the gas sample from stack/duct/process. The probe is design immediately extracts the gas sample from the source and dilutes the gas sample to a clean and dry state. This process allows for simple distribution of the sample gas via a low-cost, self regulated sample line to the gas detectors, thus assuring accurate measurements. This method also allows for a very accurate and safe measurement in highly corrosive applications, or where a wet-based gas measurement is required by the EPA.

The dilution probe's critical orifice, which performs the dilution of the gas, is integrated into the probe outlet and is heated with the probe to a stable temperature.

The incorporated pre-heater also heats up the dilution gas to the probe temperature. These steps assure that sample gas temperatures never drop below the dew point. Calibration gas enters the probe via an integrated connection. The probe can be heated up to 32°C.

Dilution Conditioning Unit (DCU)

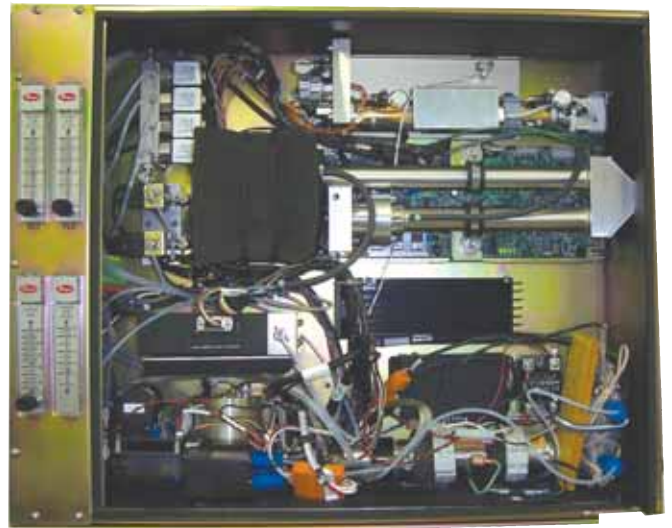
The Dilution Conditioning Unit delivers a clean, filtered, regulated and dry dilution air supply to and from the Dilution Probe. The DCU easily mounts on the wall of either an instrument shelter or an environmentally controlled control room. It is very compact and versatile.

All components included on the DCU are easily viewed and accessible for maintenance. Unlike the typical NEMA rack mount type cabinets with their difficult to reach components, the DCU's panel design allows for easy access to all of the components without having to first remove other components. The Panel is completely piped and wired and accessible to the customer via bulkhead and terminal block termination points. All lines, fittings and valves are Stainless Steel, Teflon and Polypropylene.

The panel is equipped with highly sensitive conditioning filters and moisture dryers that remove the trace amounts of hydrocarbons, SO₂, NO_x and CO pollutants that may be present in the instrument air source. The removal of these gas constituents is critical to the accuracy of the dilution system. Once the pollutant gas constituents are removed, the air is then passed through a regenerative type technology CO₂/H₂O dryer removal system. This final stage of cleaning and drying ensures that the air is now ready to pass through to the Dilution control stage. The dilution control unit is equipped with pressure transducers, vacuum transducers, mass flow controllers, valves, filters and regulators that serve to completely regulate the dilution air to assure that a consistent and controlled air source is sent to the dilution probes critical orifice. All pressure, flow and vacuum values are all controlled by the MAS panel PC104 and can be easily viewed via the web browser or Pocket PC.

All vented gases or drained fluids are vented through bulkhead unions. Customer may rout them to a sump. 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.

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



Measurement Analysis System (MAS)

The UltraCEM-PD design includes a Measurement Analysis System panel, which contains all of the measurement detectors and computer components. Like the DCU, the MAS easily mounts on the wall of an instrument shelter or an environmentally controlled control room.

The MAS is equipped with two separate compartments, a Detector Compartment and an Electronics Compartment.

The Detector Compartment houses all of the gas detectors in a safe and temperature controlled environment. Following are the functionalities.

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. The technique used here is known as gas filter correlation.

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 is filled with nitrogen. 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.

NOx Detector (Chemiluminescent)

The NOx detector consists of an ozone generator, chemiluminescence reaction chamber and a photomultiplier tube detector. The reaction chamber operates at atmospheric pressure, 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 an 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.

SO₂ Detector (UV-GFC)

The absorption measurement in the UV spectral range is based on the same principle as the IR-GFC measurement.

Temperature Control

All measurement detectors are located in a box design, equipped with a compact and highly efficient, environmentally sealed, thermo electric controlled

heater system. The enclosure is kept at a constant temperature (40°C +/-0.1) enabling the analyser to produce extremely accurate measurement results due to ideal and stable temperature.

Mass Flow Controller

The detector housing is equipped with a small, highly powerful Mass Flow Controller to accurately and precisely control the diluent gas flow to the dilution probe eductor. By utilising a smart computer controlled mass flow controller the UltraCEM-PD can easily outperform traditional mechanical regulation systems. Unlike mechanical pressure regulators used by other manufacturers the mass flow controller can easily accommodate for violent swings in ambient temperature, incoming pressure changes, downstream pressure changes and barometric pressure changes.

The use of the PC104 computer allows the mass flow controller to regulate a precise flow and pressure to the dilution probe eductor which enables the dilution ratio to remain very constant thus a very stable and accurate gas measurement is attained.

Sample and Calibration Gas Distribution

The Analysis Panel comes equipped with a 3-way universal solenoid to accommodate the gas sample for either the normal stack gas sample, or to send the calibration gases directly to the analysers (otherwise known as a local calibration.) The UltraCEM-PD is also equipped with a manifold with four two-way, Normally Closed solenoid valves to direct the customer supplied calibration gases into the system. The four valves are used for: Zero, Mid and Span gas calibrations respectively.



PC-104 System Controller/Data Acquisition System

The PC-104 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-PD.

Both analog and digital inputs and outputs are provided, including data correction and average values.

The PC-104 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 CO₂ diluent correction and stores data as separate value.
- Uses Standard Ethernet port for HTTP Webbrowser viewing/internet Data Download capability. 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 TCPIP communications capabilities.
- Utilises 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-P'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.

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.

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 Controller calculates the zero and span drift value for each detector.

Easy Communication Access

The MAS is equipped with an easy to access signal connection panel. Connections for RS232, RS485, USB, Ethernet, Printer Port, Monitor, Keyboard and Mouse are all readily accessible to the user.



1 Year Ownership Cost Comparison

Item	1 Year Cost UltraCEM (US\$)	1 Year Cost Others (US\$)
UltraCEM-DP Unit Cost: CO ₂ , NO _x and SO ₂	\$45,000	\$75,000
DAS cost (Part 60)	\$15,000	\$30,000
Shelter cost (4'D x 6'W x 8'H)	\$15,000	\$20,000
Annual shelter maintenance	\$4,000	\$5,000
Shelter installation	\$4,000	\$5,000
Peripheral installation costs	\$9,000	\$10,000
TOTALS	\$92,000	\$135,000
Savings PER UltraCEM =	\$53,000	

Equipment to be supplied by others:

- Instrument Air supply
- 85-125 VAC, 50-60Hz plant power supply
- Wiring trays for electrical interconnection wiring
- Sample ports for probe connection
- Mounting Hardware

Optional equipment which can be supplied by Goyen:

- Calibration gas bottles
- Calibration gas regulators. Dual stage with CGA connector
- Self regulated Sample Line between dilution probe and 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, PC-104 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 (COandCO ₂), UV-GFC (SO ₂), Chemiluminescent (NO _x), (THC) FID
Mounting:	Wall Mount
Area Classification:	General Purpose
Compliances:	CSA (Pending)
Ambient Temperature:	Range: 5° to 40°C.
Relative Humidity:	99%
Instrument Weight:	60 lbs Typical
Size:	36" x 24" x 0.125" (H W D)
Ranges:	CO: 0 - 5 ppm Selectable to percent levels (1 ppm increments) CO ₂ : 0 - 10 ppm Selectable to 100% (1 ppm/% increments) NO _x : 0 - 5 ppm Selectable to 10,000 ppm (1ppm increments) SO ₂ : 0 - 5 ppm Selectable to percent levels (1 ppm increments) THC: 0 - 5 ppm Selectable to percent levels
Sample Temperature:	0°C to 55°C
Sample flow rate:	5 to 8 litres/min
Warm Up Time:	Max 25 minutes

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 , NO _x and 3 spares) Analog Inputs: 4 (Typically; Flow, Opacity, MW, Fuel Flow)
Digital:	Digital Outputs: 10 dry contact digital Outputs; maximum 110VAC @ 1 amp load. Typical; O ₂ , CO, CO ₂ , SO ₂ , and NO _x 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.

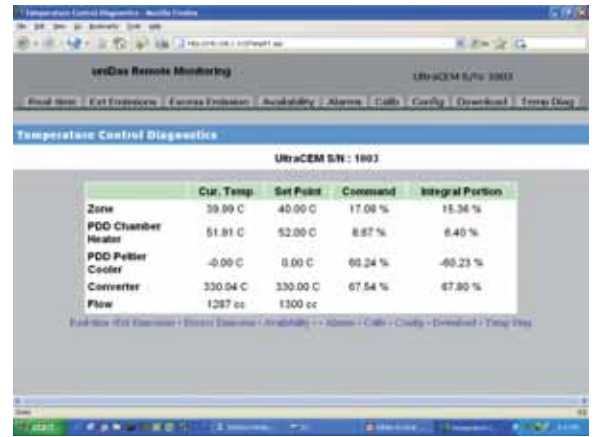
Specifications (cont)

	NDUV SO ₂ /FID THC	NDIR CO/CO ₂	Chemiluminescent NOx
Linearity	< +/- 1%	< +/- 1%	< +/- 1% (1)
Zero Drift	< +/- 1% /day	< +/- 1% /day	< +/- 1% /day (1)
Span Drift	< +/- 1% /day	< +/- 1% /day	< +/- 1% /day (1)
Repeatability	< +/- 1%	< +/- 1%	< +/- 1%/day (1)
Response Time (t ₉₀)	30 < +/--t ₉₀ < +/-45s	10s < +/--t ₉₀ < +/-30s	15s < +/--t ₉₀ < +/-30s
Influence of Ambient Temperature (5°C to 40°C)			
- On Zero	< +/-2%	< +/-2%	+/-2%
- On Span	< +/-2%	< +/-2%	+/-2%

Sample Pocket PC Screens



Sample Menu Screens





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