Product Data Sheet
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MicroCEM™

Continuous Emissions Monitoring System

- Compact, accurate and powerful multi-channel emissions monitoring system
- Field-mountable, NEMA 4X (-30 to 50°C ambient temperature range) design eliminates the need for high-cost shelters
- Time-proven, highly accurate/sensitive gas detectors:
  – paramagnetic (O_2), NDIR (CO), chemiluminescent (NO_X) and NDUV (SO_2) detectors
- Semi-conductor industry-standard PC-104 electronics allow for easy plug and play
- Ultra-flexible pocket PC display/keypad
- HTML “web-browser” operator interface provides user display and interface from anywhere in the world via the world wide web
- Built-in data acquisition handling system
- 40 CFR Part 60/75-compliant
- Independent analysis and sample conditioning enclosures allow maximum installation flexibility
- Robust sample conditioning components – Heated sample line not required
- Modular, cost-effective, two-point stream switching option capability – MicroCEM TS
- Hazardous area, Class I, Div. II purged option

PRODUCT DESCRIPTION

Emerson’s Rosemount Analytical MicroCEM™ is a compact, field-mountable continuous emissions monitoring system that uses proven extractive monitoring technology, is coupled with state-of-the-art measurement detectors and uses a semiconductor industry-standard PC-104 electronics platform for maximum measurement, communications and processing capabilities.

The MicroCEM system is designed to extract a sample gas, condition the sample, analyze the sample for the desired constituents and process the emissions data by utilizing the required calibration validation calculations/ procedures and oxygen diluent corrections as stipulated in U.S. Environmental Protection Agency 40 CFR Part 60/75 regulations. The MicroCEM is also a data acquisition system that stores relevant raw/diluent corrected emissions, flags, calibrations and alarms for a period of three months.*

* Note that emission reports as specified in the user’s particular state or federal regulations shall be configured and submitted by the user. An optional DAS can be provided by Rosemount Analytical.

MICROCEM COMPONENTS

The MicroCEM consists of two major components:

- Sample conditioning/probe enclosure
- Analysis enclosure

Sample Conditioning/Probe Enclosure (Sample Extraction)

The sample gas is extracted by a specially designed probe and is then conditioned within the MicroCEM sample conditioning enclosure. The enclosure is located at the sample port location and includes the following components:

- Housing
- Probe
- Cleaning
- Sample drying
- Sample pump
- Back pressure regulator
- Ball valve assembly
- Vents and drains

Sample Conditioning/Probe Enclosure

Housing

The housing is equipped with a weather-resistant NEMA 4X-rated enclosure and can handle ambient temperatures between -30 to 50°C. The housing is completely piped and wired and is accessible via bulk-head and terminal block termination points. All internal sample lines, fittings and valving are stainless steel, Teflon and polypropylene. The components within the housing are completely accessible via front door access.

Probe

A specially designed probe located on the sample conditioning enclosure extracts sample gas from the stack. The probe is constructed of 316 stainless steel. The probe tip is fitted with a sintered filter which can easily be changed and serviced. Calibration fittings are provided so that the system complies with guidelines for auto calibration as outlined in U.S. EPA 40 CFR Part 60/75 regulations. Rosemount Analytical provides a solenoid-operated valve for automatic blowback of the probe. Instrument air supply must be provided by the user.

A 4” mating flange is standard.

Cleaning

The gas sample is cleaned by two levels of filtration: primary filtration is performed at the probe tip by using a 0.5 micron sintered filter. The secondary filtration occurs after the sample pump.

Sample Drying

The MicroCEM system provides a dry basis gas measurement.

The sample gas is dried by a dual-pass thermoelectric chiller. The chiller cools the sample to a temperature of 4°C, +/-1°C. The resulting condensed moisture is continuously drained by a peristaltic pump while the dry sample gas is allowed to continue through the system.

The sample is then passed through a membrane-type, high efficiency permeation dryer that removes the remaining trace moisture in the sample, resulting in a sample dewpoint of -30°C. This low dewpoint eliminates the need for expensive heated sample line. Economical 1/4” size Teflon tubing may be used instead for additional cost savings.

Sample Pump

The sample pump is a positive displacement pump with 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 to 10 psi.

Back Pressure Regulator

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

Ball Valve Assembly

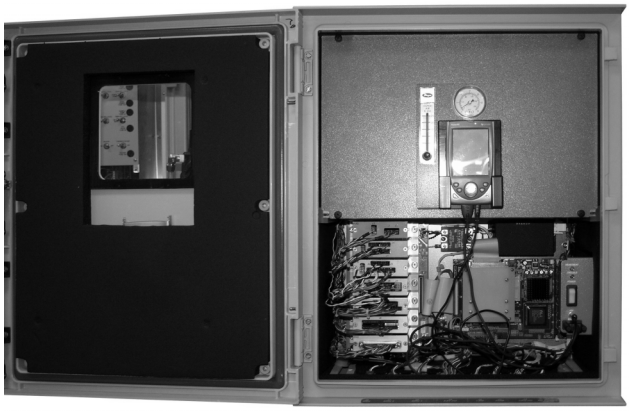
The ball valve assembly routes the stack sample into the sample conditioning stream. The calibration gas stream is routed through the probe and back into the sample-handling stream. Blowback air is routed through the probe.

Vents and Drains

All vented gases or drained fluids are vented through bulkhead unions.

Analysis Enclosure

The MicroCEM design includes an analysis enclosure which can be located at the sampling location at the bottom of the stack or in an environmental location. This enclosure is rated NEMA 4X and can be mounted beside the sample conditioning enclosure or remotely up to 300' away (20 second response time per 100').



Inside Components

O_2 Detector (EO_2)

The oxygen measurement for diluent correction to determine emissions in the units is required by most regulations.

To accomplish this, Emerson Process Management uses a Rosemount Analytical robust, electrochemical oxygen detector. When sample gas is passed over a selective gas diffusion membrane, any oxygen present diffuses into an electrolyte. The oxygen is absorbed and is reduced to water. Lead oxide is developed at the anode. Electrons generated at the anode flow to the cathode of the cell producing a current that is proportional to the oxygen concentration. The principle offers a cost effective analysis with negligible interference, ease-of-maintenance and immunity from vibration. The standard range is 0 to 25%.

O_2 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 is compact, has fast response (7 seconds) and a wide dynamic range. The long-life cell is corrosion-resistant and is easily cleaned. It has rugged self-tensioning suspension and is of welded, non-glued construction. The standard range is 0 to 25%.

CO Detector (NDIR)

The non-dispersive infrared method is based on the principle of absorption of infrared radiation by the sample gas being measured. The gas-specific wavelengths of the absorption bands characterize the type of gas while the strength of the absorption gives a measure of the concentration of the gas component.

The optical bench is employed using an infrared light source, analysis cell, a chopper wheel to alternate the radiation intensity between the reference and measurement side and a photometer detector. The detector signal alternates between concentration-dependent and concentration-independent values. The difference between the two is a reliable measure of the concentration of the absorbing gas component. The standard range capability between 100 to 1000 ppm is adjustable.

NO_x (Chemiluminescent)

The CLD consists of an ozone generator, chemiluminescence reaction chamber and a solid-state photodiode detector. The reaction chamber operates at atmospheric pressure, eliminating the need for the bulky vacuum pump found in other chemiluminescent instruments. The CLD reaction between ozone and nitric oxide is used to determine the presence of oxides of nitrogen (NO_x) in a sample gas. Nitric oxide and ozone readily react to form nitrogen dioxide in a electrically excited state. The excited NO_2 immediately reverts to the ground state, emitting photons. The light intensity is measured by the photodiode detector. The standard range capability is between 10 to 1000 ppm and is adjustable.

SO_2 Detector (UV)

The absorption measurement in the UV spectral range is based on the same principle as the IR measurement; a glow-discharge lamp is used as the UV radiation source. This UV radiation source immediately passes through the chopper wheel, through the filter cell and then into the dual section (Reference and Measurement) analysis cell. The radiation source is then passed through a second filter cell that is located after the analysis cell. The photodetector then converts the pulsating radiation intensities from measuring and reference side of the analysis cell into electrical voltages. The standard range capability is between 50 to 1000 ppm and is adjustable by user.

Automatic Calibration

To minimize the effect of long-term zero and span drift in each analyzer detector, the PC-104 system controller periodically initiates a calibration cycle as specified by the user. This feature assures reliable, accurate data while minimizing the attention required by operating personnel.

At adjustable intervals, the microprocessor will energize the appropriate valves which cause first zero, mid and then span gas to flow through each analyzer. When the analyzer readings stabilize, the microprocessor 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 and then reset.

PC104 System Controller/Data Acquisition System

The PC104 is a standard, PC-based platform and performs all hardware control, as well as provides select data processing capabilities for the MicroCEM. Both analog and digital inputs and outputs are provided, including data correction and average values.

Capabilities include:

- All automatic and manual functions
- Automatic calibration of each gas analyzer at selected time intervals to ensure accuracy and regulatory compliance
- Automatic backpurge control of sample probe with instrument air
- System limit and failure alarms
- I/O digital and analog signal interfaces
- Calibration correction factor for each analyzer output, data averaging for regulatory requirements (3 months data storage of 15 minute and 1 hour average, 1 week storage of 1 minute averages)
- Oxygen diluent correction and stores data as separate value
- Optional modem (HTTP web browser) viewing/internet data download capability. Menu and data accessible from anywhere in the world from any PC via the internet
- RS232, RS485 or Ethernet links use state-of-the-art TCP/IP communications capabilities
- Single button initiate to download data into Excel format. Simple regulatory reports can then be tailored by the user
- Two optional analog inputs (MW and fuel flow)
- Data for the following:
  - O_2% measurement and status flag
  - CO ppm measurement and status flag
  - CO ppm diluent corrected and status flag
  - NO_X ppm measurement and status flag
  - NO_X ppm diluent corrected and status flag
  - Data logs to view: date, time, 1 minute average, 15 minute average, 1 hour and 24 hour average
  - O_2/CO/NO_X data
  - complete trouble/limit alarm log
  - complete zero, mid and span calibration summary; manual calibration summary

Pocket PC Display

The MicroCEM analysis enclosure internally employs a standard, robust pocket PC which runs on Microsoft® Windows CE. The pocket PC is very flexible and allows the user to easily scroll through menus and view the data with the high resolution display. The pocket PC can also be removed from the enclosure and operated via a 4' cable.

Sample and Calibration Gas Distribution

- The gas and calibration gas samples are controlled by a single, adjustable total flow flowmeter with visual indication.
- The analysis enclosure 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 analyzers otherwise known as a local calibration.
- The MicroCEM is equipped with a manifold with three, two-way closed solenoid valves that will direct the calibration gases into the system. The three valves will be used for zero, mid and span gas calibrations respectively.
- The enclosure is equipped with a gas vent line.
- The chemiluminescent detector requires a continuous source of instrument air. The enclosure is equipped with a bulkhead fitting for this connection.

Accurate Enclosure Temperature Control

- The analysis enclosure is equipped with a compact and efficient environmentally-sealed thermoelectric cooling/heating air temperature control system. The enclosure is kept at a constant temperature (40°C, +/-1°C) enabling the analyzer to produce extremely accurate measurements due to the fact that the temperature control is stable and at an ideal temperature.

Two Point Stream Switch Option

For applications on SCR or Time Sharing between two stacks, the MicroCEM TS Stream Switch option is very efficient in both cost and space. For this option, a second probe/sample handling box is added to the physical configuration. An additional small external NEMA 4X switch box is also included for this option to control the sampling and calibrations to each stream. The second probe/sample handling box feature is unique in that it allows the MicroCEM to constantly flow a gas sample to the analysis enclosure on a continuous basis. This is important because this continuous flow allows the highest possible emissions measurement up-time compared to stream switch systems where only a probe pipe is included on the second stack. In this instance, the sample must travel the full sample line length to the sample handling components each time the stream is switch. This will cost the user precious time and emission data as time passes and also leads to inconsistent calibrations. This MicroCEM stream switch option was developed with the user in mind and employs easy to use user features such as:

- Stream times and bypass times are completely selectable by the user
- Stream switching can also easily be turned off
- Stream names are selectable by the user
- Track and hold features can be turned on or off for both calibration and bypass modes
- User ability to invalidate both stacks if one stack is invalid
- The Webrowser will continuously display both streams for easy user viewing
- Three months data is stored for each stream
- Automatic calibration with user selectable times for both streams
- Ranges, dual ranges, drift failure %, calibration gases, alarms settings, calibration sequence and all other parameters can be adjusted for each stream and very user flexible