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Product Data Sheet
Monitoring Positron Emissions

PET Gas Detection Assembly
The Ultra Electronics PET Facility Stack Monitor uses a 'bypass' method of measurement. The bypass measurement involves drawing a continuous sample from the stack and detecting the radioactive concentration in a measurement chamber.

The PET Gas Detection Assembly comprises processing electronics (the CMS PET), sample flow sensor, pump equipment, measurement chamber, PG-10 detector and lead shielding, all mounted on a self-contained frame. Optionally, the system is also available with sample Iodine sample cartridge and gamma dose rate sensor.

The PG-10 detector is a unique detector that utilizes a plastic scintillation detector, sensitive to the Positron decay, not the 511 keV gamma photons.

The PET Gas Detection Assembly offers our users distinct benefits including a reduced influence from interfering ambient gamma fields, a higher dynamic range than traditional NaI(Tl) detector, and less sensitivity to temperature variations.

As its standard configuration, the system is provided with a unique double pump system. This provides the user with redundancy – so, in the event the main pump fails, the second pump can be activated to continue sampling. Alternatively, the system can be supplied with an air injection pump (using compressed air) with no moving parts for reduced maintenance.

As an alternative to the frame mounted system, Ultra Electronics also supplies a second mounting configuration where all items are designed to be attached to a wall. This configuration is often useful for clients where floor space is at a premium. Note that the wall-mounted system does not have the same amount of lead shielding.

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System Calibration

Each PET Gas Detection Assembly is supplied with a factory calibration certificate. Factory calibration is achieved by comparing the response of the clients' detector with a solid source (positioned on the outside of the detection chamber), to an original primary calibration that was performed with $^{11}CO_2$ gas.

Once installed, a solid disk source may be used to provide a cross-correlation to the factory calibration, and this can then be used by the client to check at predetermined intervals that the system is working reliably.

The system can also be recalibrated in situ if the cyclotron facility can produce $^{11}CO_2$ gas.

Stack Flow Measurement and Sample Probes

Stack flow is an important measurement parameter when deriving effluent releases.

For most installations, a multipoint insertable pitot is used to provide a measurement of stack flow rate. The pitot takes a measurement of average flow across the span of the stack, and offers better measurement accuracy when compared with conventional flow meters such as thermal anemometers.

The pitot is a passive device – where the differential pressure produced across the device is related to a stack flow – and a small local pressure measurement system is used to monitor and record stack flow. Reliable and accurate stack flow measurement is required for those sites who are required to show compliance to authorized effluent limits quoted in activity (Bq or Ci).

Stack Probes

The sample probe and return probe are a single piece, and they are installed via a plate mounted locking gland fixed to the outer stack wall.

The connection onto each probe is made via a full bore ball valve, which facilitates isolation of the stack, should any of the secondary equipment need to be removed for servicing.

A short run or reinforced sample tube routes the sample to and from the PET Gas Detection Assembly.

CMS-PET Continuous Monitoring Station

The CMS-PET Continuous Monitoring Station is a data processor and display instrument, which accepts the data inputs from the PG-10 and flow sensors. It is mounted on the PET Gas Detection Assembly.

The CMS-PET is housed in a rugged stainless steel box with a front panel and keyboard indicating alarm, status, and result data. The system uses three alarm thresholds for stack concentration (high, alert and detector fail) and any occurring alarm or status event is indicated on the front of the unit.

A large LCD graphic display provides a display of result data configured to read in engineering units. Designed to provide fast response to positron gas concentration, the CMS-PET will provide a display of concentration (Bq/m^3 or pCi/ml) and volumetric stack flow (m^3/sec or cfm).

Working parameters may be accessed via the keypad, which is passcode and key protected to prevent unauthorized access.

From the CMS-PET, an Ethernet connection (or optionally RS-485) is made to a local PC running 9205-PET application software.

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Monitoring Options

In addition to the effluent stack monitor, The CMS-PET can control a range of sensors for exhaust duct measurement.

Using a shielded gamma detector, a duct sensor can be used to continuously monitor effluent within the duct and activate damper controls if necessary. The duct sensor is an effective way of monitoring releases from cell ducts prior to entry into the main stack.

9205 PET Data Management System

The heart of the system is the 9205-PET Data Management System. The 9205 is an advanced data logger that records data from the CMS-PET (and any additional stations on the network), generates alarms in the event of system status change, compiles a result database of historic result data and allows the production of the effluent reports as required.

The 9205 PET Data Management System provides the following data display screens

- **Facility Plan**: Showing the location of each slave CMS, the status and current radiometric measurement
- **Status Matrix**: Showing the current status (alarm, fail, maintenance etc.) of each slave CMS on the network
- **Alarm Status**: Showing current network alarms and past network alarm events
- **Effluent Discharge**: Showing integrated releases and current stack effluent on a daily, weekly, monthly and annual basis
- **Historic Data (Trend)**: Showing a trend of results
- **Historic Data (Tabular)**: Showing results and status for up to three sensors between two user-selectable points in time

The 9205-PET Data Management System also supports many additional features, including data export, report generation, multiple user access modes, and data archiving. The 9205 can also be implemented across a company-wide intranet/extranet, where data from multiple systems can be accessed at a central terminal. The use of an optional web interface allows authorized personnel on the network to log in and view the data remotely.

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Specifications

NAME	DESCRIPTION
0017/019	Panel Mounted system - excludes pump.
0017/020	Skid mounted system with lead shielding - excludes pump.

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