



EMIRAK 3 Continuous Emissions Monitoring System

- Single user interface
- Ease of configuration and operation with on-line help screens
- Choice of numerical and trend displays
- Full system and analyser diagnostics with clear text messages
- Alarm and exceedances calculated on line
- Integral logger and report generator
- Easy communication with other computers

Application

EMIRAK 3 is an extractive multigas analyser system for continuous emission monitoring. It is normally used to measure the concentration of oxides of nitrogen (NO_x), sulphur dioxide (SO₂), carbon dioxide (CO, CO₂), oxygen (O₂), hydrocarbons (HCs) and water vapour (H₂O) in the flue gas of large combustion processes, incinerators and other processes when it is required by legislation.

Principle of operation

EMIRAK applies Signal Ambitech's Modular Analyser technology (MAT) to continuous emissions monitoring (CEM). Based on the principle of distributed control, MAT consists of a set of intelligent modules communicating, via an internal data highway and a bus master, with a centralised control computer. There are three different types of modules: analyser, sampling control and interface modules, each controlled by dedicated microcontroller. These microcontrollers collect data every second and prepare one minute files consisting of averaged measurements, diagnostics and mode of operation. These files are gathered, with rigorous time-keeping, by the bus master which acts as a buffer between the control computer and the individual microcontrollers. The bus master holds this data for a complete hour, giving the control computer the flexibility to gather and log the data as well as attend the other supervisory control facilities, without affecting the integrity of the collection of time-critical data. The microcontrollers are co-ordinated by the system control computer, equipped with *Emilog*, a complete software package providing centralised supervisory control via a mouse or a keyboard, as well as logging and reporting facilities. (See *Emilog* data sheet).

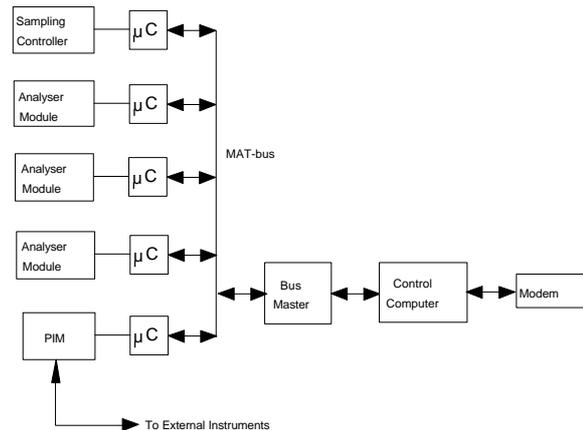
The plant interface modules (PIM) enable other external instruments to be incorporated in the EMIRAK system to take advantage of the data processing, display, logging and reporting facilities.

With EMIRAK 3, the flue gas is sampled using an extraction package controlled by the sampling control module and maintained at 180°C. This package comprises probe, heated filter, heated line and heated pump, and provides a clean hot sample gas to those analyser modules requiring the sample to be maintained above water, hydrocarbon, and acid dewpoints. The sample gas also passes through a chiller kept at 3°C where the water and acids are removed as they form by a dedicated peristaltic drain pump, hence providing clean, dry sample gas to those analyser modules which require it. The sample, pressurised to 1.33 atmospheres by the pump, has a water dew point at 3°C, equivalent to the dew point at 0°C

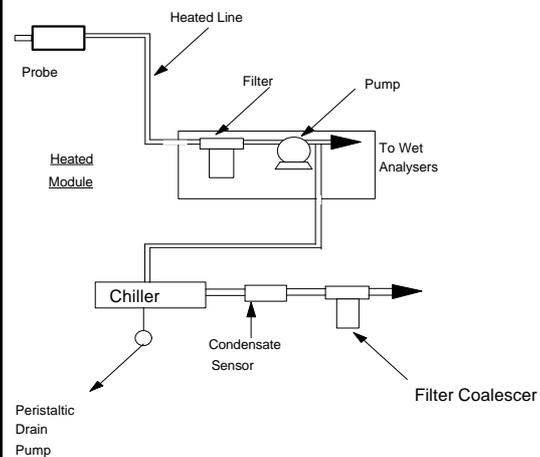
and atmospheric pressure. Removal of water to meet legislative requirements is therefore achieved without "icing" problems. A condensate sensor interlocked with the sampling pump and a filter coalescer are also provided to ensure that no particulates, aerosols or water reach the dry analysers under any circumstances.

Wet/Hot analysis

The main gases in this category are:



MAT Architecture



Emirak 3 Flow Schematic

Hydrocarbons: In order to overcome the potential problems of condensation associated with hydrocarbons and to achieve accurate measurement, the sample gas must be maintained above its dewpoint at all times i.e. during its extraction, transport and analysis.

NOx: NO₂ is highly soluble in water. If water is provided prior to analysis, a significant proportion of the NO₂ present is lost. Therefore, if the quantity of NO₂ is greater than 10% of the total concentration of NO_x, it is recommended that the sample be analysed by heated chemiluminescence.

O₂: The dual measurement of oxygen in both dry/cold and wet/hot gas states, allows the calculation of water vapour concentration for reporting emissions data corrected from wet to a dry gas basis.

Dry/Cold state analysis

The main gases in this category are:

CO, CO₂: Measured by infrared absorption, they must be analysed in a dry state since infrared measurements are prone to water vapour interference.

SO₂: Also measured by infrared absorption. SO₂ is slightly soluble in water, therefore, a rapid sample chilling and immediate removal of condensate is performed to ensure that the integrity is maintained.

O₂: Measured dry by an accurate zirconia sensor to enable reporting of emissions data to reference oxygen conditions.

Dimensions (maximum): depth x width x height
 19" single bay rack: 800mm x 600mm x 2100mm
 19" double bay rack: 800mm x 1200mm x 2100mm
 Access at front and back is needed for maintenance.

Gas	Dual Range	Technique	Analysis state
Hydrocarbons	0-100ppm, 0-500ppm	FID	Wet
NO _x	0-100ppm, 0-1,000ppm	Chemiluminescence	Wet
SO ₂	0-100ppm, 0-1,000ppm 0-500ppm, 0-5,000ppm	Dual beam NDIR	Dry
CO	0-100ppm, 0-1,000ppm 0-100ppm, 0-500ppm	Single beam NDIR Dual beam NDIR	Dry Dry
CO&CO ₂	0-500ppmCO & 0-20%CO ₂	Single beam NDIR (dual gas)	Dry
CO ₂	0-10% 0-20%	Single beam NDIR	Wet or Dry
O ₂	0-25%	Zirconia Sensor	Wet
Water Vapour	0-30% 0-100%	Dual O ₂	Wet and Dry

Recommended clearance: 800mm

Weight (maximum):
 19" single bay rack: 250Kg
 19" double bay rack: 250Kg

Power Supply:
 Distribution: via 30mA trip RCD's and MCB's
 Voltage: 110V or 230V 50Hz, or 110V 60Hz. All - 10% +6%

Maximum consumption:
 Probe: 700W
 Heated line: 80 to 100W per meter (25A max). Other power available as option.
 Rack: up to 3000W

Environmental conditions:
 EMIRAK, in its basic form, is designed to work in an indoor clean environment (IP40) within the following conditions:
 Temperature: min 10° C, max 25° C (storage 0-40° C)
 Humidity: max 90% RH non condensing
 If the conditions are outside these parameters, a range of optional additional enclosures are available.

Optional enclosures:
 For indoor applications
 Glass door fitted racks, with or without locking system
 For outdoor applications
 Cubicles for single or double bay EMIRAKS, with air conditioning (IP65)
 Walk-in cabins with air conditioning (IP65)
 Purged enclosures for hazardous applications are also available.

Calibration gases:

Calibration gases are not normally part of Signal Ambitech's supply as the hiring and replacement of cylinders is best made by the user. For recommendation about the composition and concentration of the various calibration gases, see the EMIRAK analyser modules data sheet.

Customer connections:

Electrical power:
 Through gland plate, top or bottom, into distribution unit equipped with RCD.
 Remote communications:
 Standard:
 1 serial port: RS232 or RS485
 analog outputs: 0-10V and 4-20mA, negative ground

Options:

0-1V analog output (with this option, 4-20mA not available)
 4-20mA isolated outputs
 volt free contacts for status
 isolated digital inputs for remote sampling control
 For more information, see TN 7000 and TN 8000
 Pipe connections:
 Calibration gas and support air: 1/4" OD compression fittings*
 Gas vent: 3/4" UPVC BSPF*
 Liquid drain: 3/4" UPVC BSPF**
 Heated line: 1/4" OD compression fittings*

*through top panel
 **through side panel at low level