ELECTROCHEMICAL & % LEL ANALYZERS

Safety, Stack & Environmental Monitoring

CO_2, CO, O_2, O_3, SO_2, H_2S, NO, NO_2, NH_3, HCl, Cl_2, PH_3, SiH_4, HCN, H_2, ETO, Formaldehyde, % LEL

PID ANALYZERS

MODEL 1000 GAS ANALYZERS

CO_2, CO, O_2, O_3, SO_2, H_2S, NO, NO_2, NH_3, HCl, Cl_2, HCN, H_2, ETO, Formaldehyde

Introduction

The **Model 1000** Analyzers are reliable, flexible and versatile instruments based on electrochemical sensors for the measurement of chlorine (Cl2), hydrogen cyanide (HCN), carbon monoxide (CO) other toxic gases in the workplace. These analyzers have an optional setpoint meter that can be used to control outside air vents or alarm if the gas is above an alarm level. These products are available in a NEMA 4 wall mount configuration.

Other Continuous Analyzers include the Model 201-B PID or FID Analyzer for total VOCs, a thermal conductivity detector (TCD), Model 204 and a Model 210 Paramagnetic Oxygen Analyzer. The addition of these new Analyzers greatly improves the capability and range of process analyzers from PID.

Principle of Operation

Amperometric techniques can use two or three electrode systems for detection. A membrane is used to separate the phase being measured (air containing a toxic gas) from the electrolyte where the measurement takes place. The oxygen electrode was first described by Clarke in 1956 and is perhaps the best known of this type. Here, a fixed potential is applied to one electrode and the current generated by oxygen being consumed according to:

$$O_2 + 2H_20 + 2e^- \rightarrow [H_20_2] + 2OH^-$$

is measured.

Various organic and inorganic compounds can be sensed at an electrode interface by applying a voltage that is equivalent to the oxidation or reduction potential. As the appropriate compounds diffuse to the electrode, they will be oxidized or reduced and will produce a current (proportional to concentration). This signal is amplified and displayed on the digital meter. The calibration value for each sensor is stored in the processor memory for later retrieval. *Other types of electrochemical sensors include potentiometric types such as NH_3 and CO_2.*

Applications

Hydrocarbons & Methane (CG or TCD)

Drying oven % LEL
Pill Coating % LEL
Stack & Vent monitoring % or % LEL
Monitoring workplace atmospheres
Control outside makeup air to minimize air exchanges and keep toxic gas levels at a minnimum
Detection of leaks from processes
Monitor/Control the buildup of indoor air pollutants
Safety Monitoring
Stack gas monitoring- SO_x, NO_x, CO, O_2- Sampling systems available
Scrubbler outlets- efficiency of HCl, NH_3, H_2S

Features-

Automatic Restart- In the event of a power outage, the instrument will automatically restart

Wide operating range with no range changing necessary- **16 Bit ADC**

Push button calibration- automatically adjusts response

RS232 digital output- can print to a serial printer or print to a PC; **4-20 mA analog** output (optional for single channel) to interface to PLC or DCS system. For multichannel data acquisition, the RS485 output is required.

Stored calibration values

Audible alarm- internal

Datalogging (programmable) for 7,000 points

Easy to calibrate; Turn on/off functions via simple keypad

Interchangeable electrochemical detectors

Battery operation is available as an option

Low Cost Single or Multisensor (up to 4) Analyzers, Sampling Systems

Specifications

Electrochemical Sensors, CG, & TCD sensors are available (see back Page Table I).

Available in two configurations:

Single component or Multiple component (2-4 sensors); 1 CG or TCD plus 3 electrochemical sensors

Measurement mode: Continuous

Response time- 20-50 sec. to 90%

Zero drift- Automatic compensation; <1-2% per month

Span drift- less than 2% every month

Single alarm- customer programmable

Wide range of response- from ppm to 100 %

Readout- $5^{1/2}$ digit LCD smart panel meter with backlighting

Standard output: RS232; optional outputs- 4-20 mA & RS485

Enclosure:Wall (NEMA 4)-General Purpose 6.75" W x10$^{3/8}$"H x 6"D;

Weight: 7.4 pounds

Power requirements- 100-240VAC, 1 amp

Range-

Sensors can be used for safety or environmental monitoring at low ppm levels. Oxygen can be measured at % levels or ppm levels depending on the application. A special oxygen sensor is available for measuring oxygen in stack gases where the acid gases can interfere with operation. For a number of combustion gases such as: SO_2, NO, NO_2, hundreds to thousands of ppm can be measured instead of low ppm. These electrochemical sensors have filters to minimize interferences. The CG and TCD measure low % levels to 100% respectively.

Options

4-20 mA output (single sensor); RS485 output (multiple sensors)

Single alarm setpoint- Customer Programmable

Data acquisition and storage using DataWorks software

X Proof- explosion proof enclosure

(see 900 transmitters)

Sampling Systems

One of the most difficult challenges is to deliver a sample stream saturated with water at an elevated temperature to the analyzer without any change in the composition of the compounds to be measured. A photo of one of our sample conditioning system is shown below. For additional information, please contact PID Analyzers.

The system below requires only compressed air for operation and removes all liquid water from the sample. It can be used in a Class I Div 1 area.

We also offer heat exchangers and heated sample lines for other types of samples. A heated permeation sampling system is ideal for SO2 and NOx from combustion sources.

Sensor Specs, DataWorks Software, Transmitters

Table I

Sensor Specifications

Sensor	Range ppm	Detection Limit	ResponseTime (s)	Interferences
Ammonia	0-3,000	0.1	30	Amines
Carbon Dioxide	0-10,000	10	45	Acid Gases
Carbon Monoxide	0-1,000	0.5	15	H_2, C_2H_4
Chlorine	0-10	0.1	30	
ETO	0-100	0.1	30	MEK, Ethanol
Formaldehyde	0-100	0.1	30	Oxygenated HC
Hydrogen Cyanide	0-100	0.1	50	C_2H_4, H_2S, SO_2
Hydrogen Chloride	0-100	0.1	15	SO_2, NO_2
Hydrogen Sulfide	0-100	0.1	20	——-
Hydrogen Sulfide	0-5,000	0.1	15	—— with filter
Nitric oxide	0-250	0.1	10	NO_2
Nitric oxide-SG		0.1	10	——— with filter
Nitrogen Dioxide	0-20	0.1	15	NO, H_2S
Nitrogen Dioxide-SG	0-200	0.1	15	H_2S
Oxygen	0-30%	0.1%	8	——-
Oxygen-SG**	0-30 %	0.1%	8	——-
Oxygen	0-2%	0.1	15	——-
Ozone	0-2	0.02	75	NO_2
Phosphine	0-5	0.05	40	SiH_2, GH_4, B_2H_6
Sulfur Dioxide	0-5	0.1	20	NO_2
Sulfur Dioxide-SG	0-5000	0.1	20	NO_2 filter
Silane	0-5	0.05	30	AsH_3, PH_3, B_2H_6
Combustible Gas	0-100 % LEL	0.1%	10	——-
Thermal conductivity	0-100% v/v	0.1%	15	——-

SG= Stack Gas Sensor, ** Uses acidic electrolyte to prevent interferences from acid gases

DataWorks

Data Works is PIDs data collection and logging software that can be used with a wide variety of Sensor or Analyzer outputs such as Ethernet, RS485 & 4-20 mA . The latter two outputs are for long distance transmission of data as shown in Table I below. In-plant installations are typically 4-20 mA or RS485 because of the long distances involved 1,000-5,000'.

Each day at midnight, a new CSV or text file is created and named (by date). These files can be directly imported into EXCEL.

Model 900- Infrared Transmitters

PID Analyzers offers a new explosion proof transmitters (electrochemical, combustible gas, IR and TCD for chemical loading, leaks, waste water treatment... applications. . The 4-20 mA transmitter is in a explosionproof junction box at or near the sensor. The readout unit can be located > 300 meters away in the control room. The sensor is designed for Class I Groups BCD.

Applications for Transmitters

Chemical plants
Refineries
Solvent Mfg., Unloading chemicals

PID ANALYZERS

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