

IR

The technique for measuring the concentration depends upon the Lambert Beer Law:

$$I = I_0 e^{-kx}$$

Where- I is the measured intensity

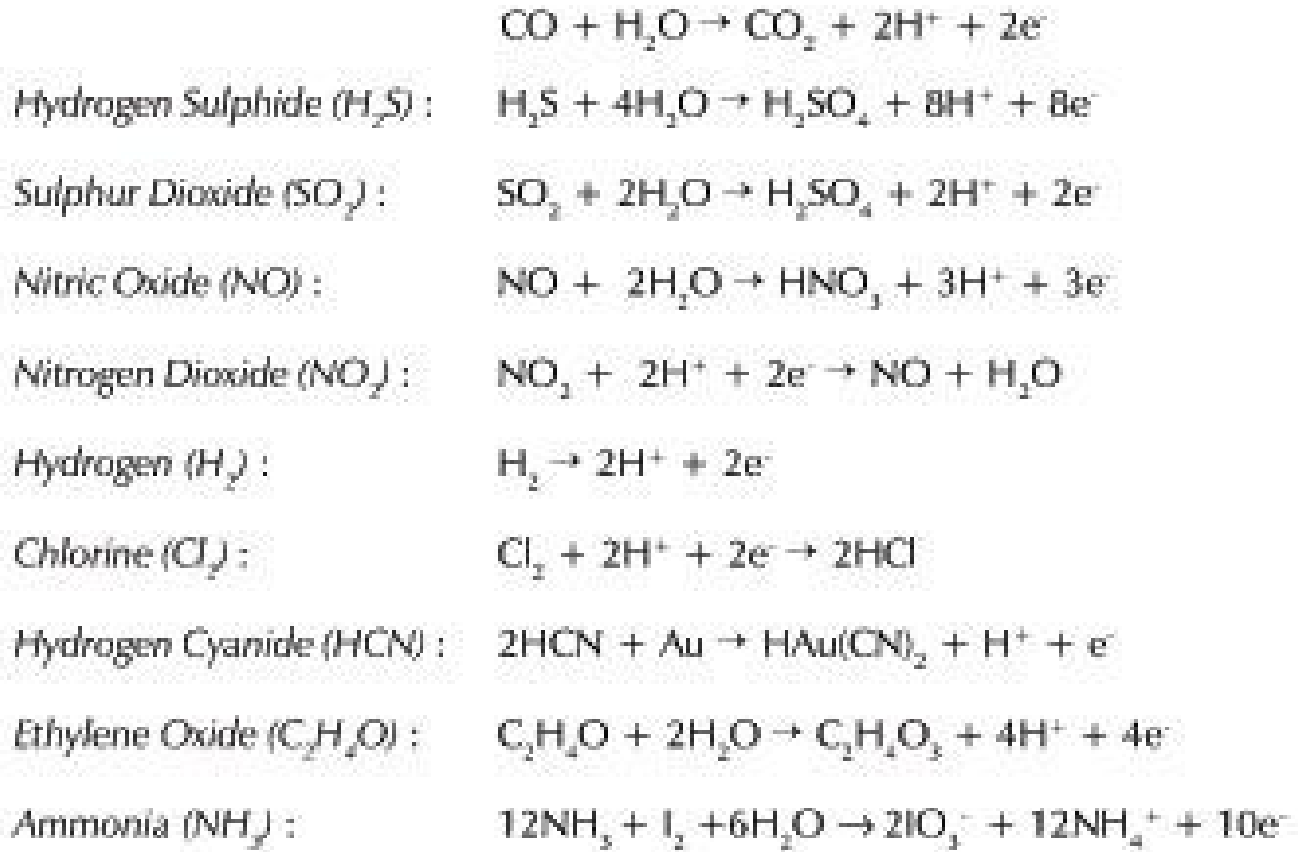
I_0 is the incident intensity k is the absorption coefficient

x is the pathlength

This dual beam sensor consists of a pulsed IR source, a fixed path length cell, a measurement filter, a reference filter and an IR detector (thermopile). Infrared radiation in the 4 to 5 micron region is absorbed by carbon dioxide and converted into molecular vibration energy. This absorption is associated with the C-O stretching, or bending frequencies. Infrared absorption spectra are due to transitions between vibrational - rotational levels.

Electrochemical (EC) -

Two and three electrode systems are used for the electrochemical sensors. Sensor technology includes potentiometric (CO_2 , NH_3), fuel cell (O_2) and amperometric (SO_2 , H_2S , ...) where the sample is oxidized or reduced. Sensors are chosen to maximize performance and lifetime. The sensors can be easily interchanged via the plug-in sensor board and embedded software. Some of the reactions involved include the following:



RH/T

The relative humidity (RH) sensor uses a thermoset polymer with three layer capacitance construction. The electrodes are platinum with on-chip signal conditioning. Water vapor in the active capacitor's dielectric layer equilibrates with the surrounding gas and produces a voltage that is proportional to the RH. The porous platinum layer shields the dielectric response from external influences while the protective polymer over layer provides mechanical protection for the platinum layer from contaminants such as dirt, dust and oils.

The temperature sensor is a platinum resistance temperature device that is incorporated into the RH sensor package.

4. SENSOR SPECIFICATIONS

| | Det. Limit | Response Time | Interferences |
|------------------------|-------------------|----------------------|---|
| PID | | | |
| 9.5 eV | 0.1 – 3,000 | 0.1 | 1s |
| 10.6 eV | 0.1 – 3,000 | 0.1 | 1s |
| 10.6 – ppb | 1-20,000 ppb | 1 ppb | 5s |
| 11.7 eV | 0.1 – 3,000 | 0.1 | 1s |
| Infrared | | | |
| LEL CH4 | 0-100% | 1% | 20s |
| CO2 | 0-2% | 0.04% | 20s |
| TCD | | | |
| Organic & Inorganic | 0-100% v/v | 1% | 20s |
| CG | | | |
| Organics- LEL | 0-100% | 1% | 20s |
| RH/Temperature | | | |
| RH | 0-100% | 0.1% | 50s |
| Temperature | 0-60°C | 0.1°C | 20s |
| Electrochemical | | | |
| Ammonia | 0-50 | 0.01 | 30 sec. |
| Carbon Dioxide | 0-1,000/0-10% ppm | | 90 sec. |
| Carbon Monoxide | 0-500/1000 | 0.5 | 10 sec. |
| Carbon Monoxide-SG | 0-1,000 | 1 | 15 sec |
| Chlorine | 0-10 | 0.01 | 30 sec. |
| Ethylene | 0-20 | 0,01 | 45 sec |
| Ethylene Oxide | 0-20 | 0.01 | 1 min. |
| Formaldehyde | 0-20 | 0.01 | 5 sec. |
| Hydrogen | 0-1000 | 2 | 45 sec. |
| Hydrogen Cyanide | 0-50 | 0.01 | 50 sec. |
| Hydrogen Chloride | 0-100 | 0.01 | 1.5 min. |
| Hydrogen Sulfide | 0-100 | 0.01 | 20 sec. |
| Hydrogen SulfideSG | 0-5,000 | 1 | 15 sec. |
| Nitric oxide | 0-50 | 0.01 | 10 sec. |
| Nitric oxide-SG | 0-1,000 | 1 | 10 sec. |
| Nitrogen dioxide | 0-10 | 0.01 | 15 sec. |
| Nitrogen Dioxide-SG | 0-200 | 0.1 | 15 sec. |
| Oxygen | 0-30% | 0.1% | 15 sec. |
| Oxygen-SG** | 0-30 % | 0.1% | 8 sec. |
| Ozone | 0-5 ppm | 0,002 | 75 sec |
| Phosphine | 0-5 | 0.05 | 40 sec. |
| Sulfur dioxide | 0-5 | 0.01 | 20 sec. |
| Sulfur Dioxide-SG | 0-5000 | 1 | 20 sec. |
| Silane | 0-5 | 0.05 | 30 sec. |
| | | | acid gases |
| | | | other acid gases |
| | | | C2H4 |
| | | | H ₂ , C ₂ H ₄ |
| | | | — |
| | | | alcohols, other org. |
| | | | alcohols, org., CO |
| | | | alcohols, CO |
| | | | CO, C ₂ H ₄ |
| | | | C ₂ H ₄ , H ₂ S, SO ₂ |
| | | | SO ₂ , H ₂ S--- |
| | | | — |
| | | | — with filter |
| | | | NO ₂ |
| | | | — with filter |
| | | | Cl ₂ , H ₂ S |
| | | | H ₂ S |
| | | | — |
| | | | uses H ⁺ electrolyte |
| | | | — |
| | | | SiH ₄ , GeH ₄ , B ₂ H ₆ |
| | | | NO ₂ |
| | | | NO ₂ filter |
| | | | AsH ₃ , GeH ₄ , PH ₃ |

There are more than 30 different sensors available for these Analyzers.
SG= stack gas sensor

5.0 PID BASED ANALYZERS- 102, 102+ 103

SPECIFICATIONS-

- Size: 10.0" L x 3" W x 2.25"D
- Weight: 1.9 pounds
- Display: 2 line x 16 character LCD display with backlighting
- Analog to Digital Converter: 16 bit
- Precision: +/- 1% with 10 ppm standard
- Accuracy: 97-98 % at 10 ppm
- Analog (Sensor)Input channels:
 - 102: 1
 - 102+: 4
 - 103 : 4
- Linear to 3,000 ppm
- ppm range- 0.1 to 3,000 ppm- Models 102, 102+ 103
- ppb range- 1-20,000 ppb 102+ (optional), 103
- Fast response 1 sec to 90%
- Battery: nickel methal hydride rechargeable
- Battery life- 8-10 hours
- Low battery indicator & automatic shutdown
- Datalogging for 7,000 points
- RS232 output
- 0-1 VSC output- programmable

FEATURES

- Single unit construction
- Easy to use even for unskilled personnel
- Simple 5 button operation
- No keyboard· Easy to use even for unskilled operators
- Library of sensitivities built in for > 250 compounds
- Use "Resp as" to setup for direct reading
- Calibrate with isobutylene or other gases
- Alphanumeric display for compound, detector, alarm, range, & logging
- Bright LED digital display for readability/backlighting selectable
- Duraclean TM PID
- Auto electronic zero in Cal, background zero
- Simple pushbutton sensitivity control
- Reliability

The basic simplicity, durable construction and design of the Model 102 has resulted in the elimination of problem areas associated with many other measurement techniques in portable analyzers.

APPLICATIONS

Non-specific- Responds to VOC's & inorganic species (NH₃, H₂S, PH₃, AsH₃, etc.)

Headspace- VOCs in soil or water- special headspace method in software

Quality control- residual monomer in resins, residual solvents in paper or food, testing gas masks, residual gases in cylinders

Emergency response- spills from trucks & trains

First responders

Arson investigations- find trace accelerants

Confined space entry- health & safety

EPA Method 21

Fugitive emissions- leak detection

Leaking Underground Storage Tanks

Building security

Indoor Air Pollution

6.0 TCD, CG, IR, EC BASED ANALYZERS- 105, 106, 107, 113, 114

SPECIFICATIONS-

- Size: 8.0" L x 3" W x 2.25"D
- Weight: 1.6 pounds
- Display: 2 line x 16 character LCD display with backlighting
- Analog to Digital Converter: 16 bit
- Precision: +/- 1-2% with 10 ppm standard
- Accuracy: 95 % at 10 ppm or 10% LEL
- Analog (Sensor)Input channels:
 - 105: 1-4
 - 106: 4
 - 107: 1-4
 - 113: 1-4
 - 114: 1-4
- Linearity: see specs for sensors
- ppm range- 0.1 to 3,000 ppm- Models 102, 102+ 103
- Fast response- see specs for sensors
- Battery: nickel methal hydride rechargeable
- Battery life- 10-30 hours
- Low battery indicator & automatic shutdown
- Datalogging for 7,000 points
- RS232 output
- 0-1 VSC output- programmable

FEATURES

- Single unit construction
- Easy to use even for unskilled personnel
- Simple 5 button operation
- No keyboard- Easy to use even for unskilled operators
- Library of sensitivities built in for each sensor: TCD, CG, EC
- Use "Resp as" to setup for direct reading
- Calibrate with other gases
- Alphanumeric display for compound, detector, alarm, range, & logging
- Bright LED digital display for readability/backlighting selectable
- Duraclean TM PID
- Zero & Span in Cal for 2 point calibration, background zero
- Simple pushbutton sensitivity control
- Reliability

The basic simplicity, durable construction and design of the Model 102 has resulted in the elimination of problem areas associated with many other measurement techniques in portable analyzers.

APPLICATIONS

EC

Safety Monitoring
Industrial Hygiene
% O₂
ppm O₂
ppb O₂
Quality control
Headspace
Stack Gas Analysis
Combustion performance- LEL/CO, LEL/O₂
Inexpensive Backup Analyzer

CG

Confined Space- CG (LEL)/O₂/CO/H₂S
Confined Space- CG (LEL)/O₂/NH₂/CH₂O
Confined Space- CG (LEL)/O₂/NH₂/C₂H₂
Leak Detection- CG
Combustion leaks- CG/CO (stack gas sensor) or CG/O₂ (stack gas sensor)

TCD

Confined Space- TCD (LEL)/O₂/CO/H₂S
Leak Detection- TCD (organics), He, H₂
Combustion leaks- LEL/CO
Composition- of natural gas
Combustion performance- LEL/CO, LEL/O₂

IR

Safety
Industrial Hygiene
Stacks
CO₂ in ambient air
CO₂ in process streams

7.0 CONTROLS & DATALOGGING

CONTROLS

On/Off- Battery power

Incr-Function ON, scrolling menu up, increase number

Decr-Function OFF, scrolling menu down, decrease number

Bkl-Turns backlight on/off

Menus

LOG

Log Manual-

Set site #, and manually log each pt.

Auto- Set ave. time (sec) and samples/hr. to Autolog Site # 1-7000

Setup- Setup Auto; Ave. time sec., samples/hour Exit- Return to Run

CAL

Cal- Performs Autozero, set cal value, calibration

Bkg Zero- used to zero out background- can be shut off by turning off the 102 then turning it back on

Cal Gas- Select name of cal gas

Resp as- Once the 102 is calibrated-change to direct reading on any of > 250 compounds Alarm-

Alarm- Turn on/Off Alarm audible alarm

Exit- Return to Run mode

DATA LOGGING

Datalogging

The portable analyzers have manual or automatic data logging capability for up to 7,000 points for 1-4 components. The software for data logging is included with the Model 102. IT uses Grapher Software for downloading the information for the 102. The Analyzer will automatically time and date stamp the data. To check the time see the Model 102+ Instruction Manual. A typical Auto data logging format is shown below: 102 Data:

| | Date | Time | | ppm |
|-----|-----------|----------|---|--------|
| SP6 | 6/12/2002 | 15:02:27 | 7 | 1.7496 |
| SP6 | 6/12/2002 | 15:03:27 | 7 | 1.6497 |
| SP6 | 6/12/2002 | 15:04:27 | 7 | 1.6498 |
| SP6 | 6/12/2002 | 15:05:27 | 7 | 1.6499 |
| SP6 | 6/12/2002 | 15:06:27 | 7 | 1.6500 |
| SP6 | 6/12/2002 | 15:07:27 | 7 | 1.6400 |

End Of Log Data

This data can be saved directly into Excel as a csv file.

