LumaSense Technologies

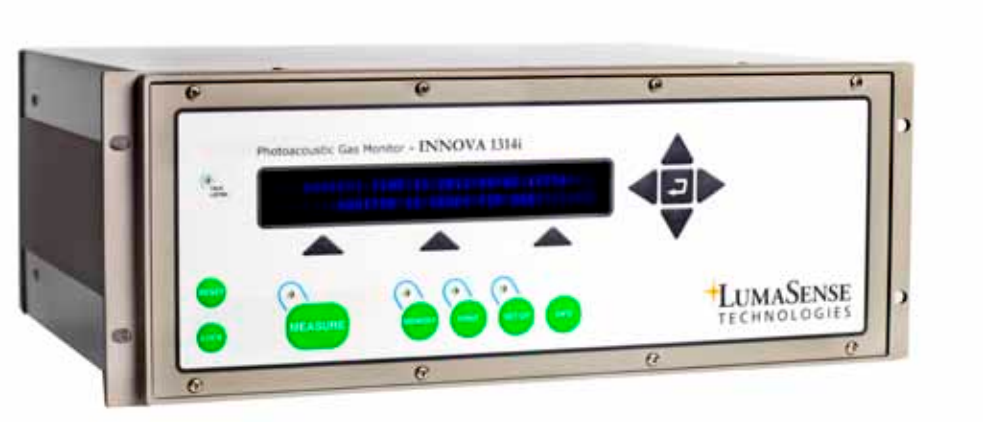
**INNOVA** Multi Gas Monitoring Instruments

Highly Accurate, Reliable and Stable Quantitative and Remote Controllable Gas Monitoring System

## INNOVA 1314i

CE

- Selectively measures a wide range of gases/vapors
- Linear response over a wide dynamic range
- Stable and Reliable: ensuring a maximum of two calibrations a year
- User-friendly: Easy calibration, configuration, and viewing and analyzing of data via PC
- Accurate: compensates for temperature and pressure fluctuations, water vapor interference, and interference from other known gases
- Operates immediately: virtually no warm-up time necessary
- Remote control capability via TCP/IP network interface protocol
- Expandable up to 24 locations with 1409 Multipoint Sampler




The INNOVA 1314i Photoacoustic Gas Monitor is a highly accurate, reliable and stable quantitative gas monitoring system. Its measurement system, based on the photoacoustic infrared detection method, is capable of measuring almost any gas that absorbs infrared light.

Gas selectivity is achieved through the use of optical filters. By installing up to five filters, the 1314i can measure the concentration of up to five component gases and water vapor in any air sample. Detection limit is gas-dependent, but is typically in the ppb region. The accuracy of these measurements is ensured by the 1314i's ability to compensate for temperature and pressure fluctuations, water vapor interference, and interference from other gases known to be present. Reliability of measurement results can be ensured by regular self tests. This measurement system requires no consumables and very little regular maintenance. For most applications, recalibration is only necessary one to two times a year.

The monitoring system is easily operated through either the front panel, with its push-buttons and display providing short explanatory texts, or the PC software. Both interfaces allow the user to configure the monitor, start a measurement sequence and view the resulting concentration values of specific gases.

The monitor is equipped with standard interfaces: USB, Ethernet, and RS-232. These enable the monitor to be integrated into automated process systems.

To ensure easy placement of the 1314i, it is housed in a rugged box that fits in a standard 19 inche rack and has a built-in pump system that allows samples to be drawn from up to 50 meters away.

**Application areas:**

- Emission monitoring - of exhausts from chemical processes, $NH_3$ in stacks, scrubber efficiency and filter break-through
- Process quality control measurements - of trace impurities in pure gas production
- Occupational health and safety measurements - of possible production or accumulation of toxic/carcinogenic substances in working areas
- Automotive monitoring - of alcohol content in vehicle exhausts and production of $NH_3$ and $N_2O$ in diesel exhausts

## Selectivity

The gas selectivity of the 1314i is determined by the optical filters installed in its filter wheel. Because water is nearly always present in ambient air and absorbs infrared light at most wavelengths, it contributes to the total acoustic signal in the analysis cell. Therefore, the monitor is permanently fitted with a special filter that measures water vapor and enables the 1314i to compensate for water vapor interference. By selecting different filters, this technique can also be used to cross-compensate for known interferent gases.

## Calibration

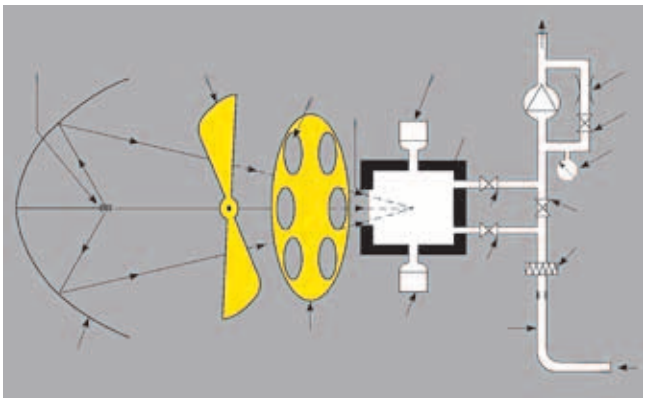
After the relevant optical filters are installed, the monitor must be calibrated. This is achieved through easy-to-use menu driven instructions. Thanks to its high stability, calibration of the 1314i is seldom necessary more than once a year. Calibration is performed using either the Calibration Software BZ7002 or directly from the 1314i front panel.

## Operation

The 1314i monitoring system is easy to operate using either the application software LumaSoft™ Gas 7810 or 7870 or the front panel push-keys (which can be locked and accessed at three levels using passwords). The monitor can be operated as both an on-line and off-line instrument. Using these user-interfaces with their logical division of information, everything that needs to be defined is achieved prior to starting the monitoring task.

## Configuring the Monitor

The Set-up option enables all the parameters necessary to complete the monitoring task to be defined.This includes setting the Sample Integration Times (S.I.T.) option, which enables measurement results to be weighted - sensitivity against speed.



## Measurement Cycle

1. The pump draws air from the sampling point through the air filter to flush out the “old” air in the measurement system and replace it with a “new” air sample. The pressure sensor is used to check that the pump sequence is elapsed successfully and to measure the actual air pressure.
2. The “new” air sample is hermetically sealed In the analyses cell by closing the inlet and outlet valves.
3. Light from an infrared light source is reflected off a mirror, passed through a mechanical chopper, which pulsates it, and then through one of the optical filters in the filter wheel.
4. The gas being monitored, causing the temperature of the gas to increase selectively absorbs the light transmitted by the optical filter. Because the light is pulsating, the gas temperature increases and decreases, causing an equivalent increase and decrease in the pressure of the gas (an acoustic signal) in the closed cell.
5. Two microphones mounted in the cell wall measure this acoustic signal, which is directly proportional to the concentration of the monitored gas present in the cell.
6. The filter wheel turns so that light is transmitted through the next optical filter, and the new signal is measured. The number of times this step is repeated is dependent on the number of gases being measured.
7. The response time is approximately 13 seconds for one gas or water vapor, or approximately 26 seconds if five gases and water vapor are measured.

## Starting Measurements

Once the set-up parameters have been defined, measurements can be started immediately or later using a delayed start time. Once started, the monitoring task continues until it is stopped either manually or using a defined stop time.

## Alarms

Two Alarm trigger levels, which provide high alarm limits for each measured gas, can be defined. These can also be linked to audible alarms using the relay outputs. In addition, the application software LumaSoft™ Gas 7810 or 7870 allows four alarm levels to be displayed.

## Online Measurement Results

Using one or more of the monitor’s standard interfaces, measurement results are transferred directly to a PC. Here they can be displayed on screen as real-time values in tables and graphs (see Fig. 1) or integrated into the process system.

In the 7870 software, the graphs can be configured to display only the desired gases, defined concentration ranges and results from statistical analyses. Also, when using the 7870 software, all measurement data is stored in user-defined SQL Server 2005 database.

## Offline Measurement Results

Gas measurement result data is displayed on the 1314i’s screen (display memory) as soon as it is available, and is constantly updated. During a task, the 1314i performs running statistical analyses of the measured gas concentrations, calculating a variety of values for each monitored gas.

This data (in Display Memory) can be copied to the Background Memory, which is a non-volatile storage area.

Data stored in Background Memory can be recalled to Display Memory. From this memory, data can be uploaded to the BZ7003 Offline Software in either excel or text file format or alternatively printed out on a standard printer.

## Reliability

Reliability can be ensured by a series of self tests performed by the monitor. The self tests check software, data integrity, and the 1314i’s components to ensure that they function properly. If a fault is found, it is reported in the measurement results, so that the integrity of the results can be ensured.

If the power-supply fails, the 1314i will automatically start up again when power is restored. Measurement data stored in the monitor's memory is not affected by power loss.

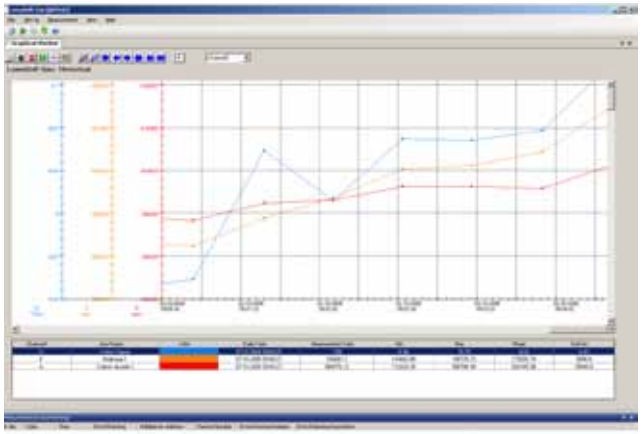


*Fig. 1 The graphical window shows up to seven graphs. The user selects the data plotted, the scaling, the style and the color of the lines and the background to build the graphical window*

### Maintenance

The only maintenance tasks necessary are calibration and replacement of the air filter. Both tasks are easily performed. The frequency for changing the air-filter depends on the individual applications.

### Remote Control Option and Multiple Point Monitoring

LumaSense Technologies offers remote control capability through the plant's local area network using the LumaSoft™ Gas Single Point 7810 or Multi Point 7870 software (optional).

Using the 7870 software, a computer can remotely control a 1314i together with an INNOVA 1409 Multipoint Sampler for sequentially monitoring air samples from up to 24 locations.

Online acces to the measurement data via a built in OPC server (alternatively via Microsoft Excel).

### Optional Modules

The functions of the 1314i can be expanded through three additional modules.

### Purge Module

The 1314i can be fitted with a "sealed box" which ensures that the measurement system inside the 1314i can be purged using an inert gas.

### Analog/Relay Interface Module

For each gas, barometric pressure and chamber temperature, the following outputs are available:

- 0-20mA, 4-20mA
- 0-10Volts (0-5V with loss of dynamic range)

| | |
|---|---|
| Accuracy: | Zero Drift: ±0.25% |
| Voltage Output: | ±1.5% of full scale |
| Current Output: | ±0.5% of full scale |
| Resolution: | 16 bit (0-20mA and 0-10V) |
| Measurement Range: | Range and zero-point are scalable in the software. Maximum load resistance on current output is 800Ω. Minimum load resistance for the voltage output is 1000Ω. |

The analog outputs are galvanically isolated from the rest of the analyser, but NOT from each other.

With the Analog/Relay Interface Module, two alarm relays are available for each gas (programmable for upper/lower concentration). Furthermore, two alarm relays are available for warning/error messages. Max 25 VDC, Max 100 mA.

## Ordering Information

**Photoacoustic Gas Monitor - Innova 1314i**

Optical filters necessary for the user's monitoring task can be ordered together with the 1314i, and installed by LumaSense Technologies. The 1314i is then delivered zero-point and humidity interference calibrated.

### Includes the Following Accessories

| | |
|---|---|
| **AT 2177** | 4m PTFE tubing |
| **DS 0759B** | Particle filter |
| **VF 0102A** | Fuse |
| **BR6011** | Set-up tree |
| **Mains Cable** | |
| **AS0001A** | USB cable |
| **BZ7002** | Calibration Software |
| **BZ7003** | Offline Software |
| **7810** | LumaSoft Gas Single Point monitoring software |

Instruction Manual (CD Rom)

### Optional Accessories

The 1314i can be span-calibrated for certain gases – contact your local LumaSense Technologies representative for details of the gases for which this can be done.

### 27 Optical Filters

**UA 0968 – UA 0989** and

**UA 0936**

**UA 6008**

**UA 6009**

**UA 6010**

**UA 6016**

### Calibrations

| | |
|---|---|
| **UA 0181** | Automated Calibration |
| **UA 0182** | Complex Calibration |
| **UA 0183** | Advanced Calibration |

### Multiple Point Monitoring

| | |
|---|---|
| **7870** | LumaSoft Gas Multi Point |
| **1409** | Multiple Point Sampler |

### Cables, Adapters, and Tubings

| | |
|---|---|
| **WL 0950-003** | RS-232 Interface cable (9pin–9pin) null modem |
| **JP 0600** | 6-pin DIN plug (male) with locking collar for alarm relay |
| **AF 0614** | PTFE tubing |
| **UA 1357A** | Genie Membrane separator |
| **UA 1365** | Genie Membrane separator (inline) |
| **UA 1373** | Analog/Relay Interface Module |
| **JZ 0102A** | 37-pin Sub-d to 37-pin screw terminal |
| **AO 1431A** | I/O cable one meter (for analog relay) |
| **AO 1432A** | I/O cable three meters (for analog relay) |
| **UA 1361A** | Purge Module |

# Technical Specifications

### Measurement Technique
Photoacoustic infrared spectroscopy.

Your LumaSense sales representative will assist in the selection of suitable optical filters. Details are provided in the Gas Detection Limits chart.

### Response Time
Is dependent on the Sample Integration Time (S.I.T.) and the flushing time defined. Please see the examples below:

### Measurement Specifications[1]

| Monitor-Setup | Response Times |
|---|---|
| S.I.T.: „Normal" (5 s)<br>Flushing:<br>Auto, (tube: 1 m) | One gas: ~27s<br>5 gases + water:<br>~60s |
| S.I.T.: "Low Noise" (20s)<br>Flushing:<br>Auto, (tube 1 m) | 5 gases + water:<br>~150s |
| S.I.T.: "Fast" (1s)<br>Flushing:<br>Chamber 4s, Tube "OFF" | One gas: ~13s<br>5 gases + water:<br>~26s |

**Detection Limit:** Gas-dependent, but typically in the ppb region. Using the Gas Detection Limits chart, the detection limit for a selected sample integration time (S.I.T.) can be calculated.

**Dynamic Range:** Typically 4 orders of magnitude (i.e. 10,000 times the detection limit at 5 S.I.T.). Using two span concentrations it can be expanded to 5 orders of magnitude.

**Zero Drift:** Typically ± Detection limit[4] per 3 months[1].

Influence of temperature[2]: +/- 10 % of detection limit[4]/°C.

Influence of pressure[3]: +/-0.5 % of detection limit[4]/mbar.

**Repeatability:** 1 % of measured value[1]

**Range Drift:** +/- 2.5 % of measured value per 3 months[1].

Influence of temperature[2]: +/- 0.3 % of measured value/°C.

Influence of pressure[3]: -0.01 % of measured value/mbar.

**Reference conditions:**

[1] Measured at 20 °C, 1013 mbar, and relative humidity (RH): 60%. (A concentration of 100x detection limit[4] was used in determining these specifications.)

[2] Measured at 1013 mbar, and RH: 60 %.

[3] Measured at 20 °C and RH: 60 %.

[4] Detection limit is @5s S.I.T.

**Interference:**
The 1314i automatically compensates for temperature and pressure fluctuations in its analysis cell and can compensate for water vapor in the air sample. If an optical filter is installed to measure a known interferent, the 1314i can cross compensate for the interferent.

**Acoustic Sensitivity:** not influenced by external sound.

**Vibration Sensitivity:** strong vibrations at 20Hz can affect the detection limit.

### Internal Data Storage Capacity
The total space available in Display Memory to store data ia 131072 measurement cycles. If a measurement cycle takes 15 sec, then the display Memory space will be sufficient for a 22- day monitoring task.

### General
**Pumping Rate:** 30 $cm^3/s$ (flushing sampling tube) and 5 $cm^3/s$ (flushing measurement chamber).

**Power Requirement:** 100-240 VAC +/- 10%, 50-60 Hz.

**Power Consumption:** ~85 VA.

**Air Volume per sample:**

| Flushing Settings | Volume of Air |
|---|---|
| Auto:<br>Tube Length: 1m | 140 $cm^3$/sample |
| Fixed time:<br>Chamber 2s, Tube 3s | 100 $cm^3$/sample |
| Fixed time:<br>Chamber 2s,Tube "OFF" | 10 $cm^3$/sample |

**Total Internal Volume:** The total Internal Volume of the measurement system: 60$cm^3$

**Alarm Relay Socket:** for connection to one or two alarm relays (visual/audio). Alarm levels for each gas are user-defined. Max. 25 VDC, max.100 mA.

**Back-up Battery:** 3V lithium battery, lifetime 5 years. This protects data stored in memory, and powers the internal clock.

**Dimensions:**
Height: 175 mm (6.9 in)
Width: 483 mm (19 in)
Depth: 375 mm (14.8 in)
Weight: 14 kg (30.8lbs)

### Communication
The monitor uses three interfaces, USB, Ethernet, and RS-232, for data exchange and remote control of the 1314i. The software communicates using the USB, Ethernet, and RS-232 interface.

### Computer Requirements
**Hardware:**
Pentium processor 2 GHZ Quad-core or better. Min. 512 MB RAM. (4096 MB RAM on Windows 8). Min. 500 MB space available on hard disk.

**Software:**
**7810/7870/BZ7002/BZ7003:** Windows® XP (SP2), Windows® 7, and Windows® 8.

**WARNING:** *The 1314i must not be placed in areas with flammable gases/vapors in explosive concentrations or be used to monitor explosive concentrations of these. Monitoring of certain aggressive gases or a very high concentration of water vapor may damage the 1314i. Contact your LumaSense sales representative for further information.*

| | | |
|---|---|---|
| CE Nemko | **COMPLIANCE WITH STANDARDS:** CE-mark indicates compliance with: EMC Directive and Low Voltage Directive. NEMKO mark indicates compliance with: CSA and UL Standards. | |
| **Safety** | EN/IEC 61010-1 3rd Edition | Safety Requirements for electrical equipment for measurement, control, and laboratory use. |
| | CAN/CSA C22.2 No. 61010-1-04 | Safety Requirements for electrical equipment for measurement, control, and laboratory use. |
| | UL 61010-1 3rd Edition | Safety Requirements for electrical equipment for measurement, control, and laboratory use. |
| **EMC** | EN 61326-1:2006 (IEC 61326-1:2005)<br>Electrical equipment for measurement, control and laboratory use – EMC requirements; Part 1: General requirements | |
| **Environment** | UL 61010A-1: Environmental conditions.<br>Altitude up to 2000 m<br>Operating Temperature: +5 °C to +40 °C<br>Storage Temperature: –25 °C to +55 °C<br>Humidity: Maximum relative humidity 80% for temperatures up to 31 °C decreasing linearly to 50% relative humidity at 40 °C<br>Pollution Degree 2<br>Installation category II<br>Indoor Use | |
| **Enclosure** | IP20 | |

## LumaSense Technologies

## Awakening Your 6th Sense


**Americas, Australia, India, China**
**Sales & Service**
**Santa Clara, CA**
Tel: +1 800 631 0176
Fax: +1 408 727 1677

**Europe, Middle East, Africa**
**Sales & Service**
**Frankfurt, Germany**
Tel: +49 69 97373 0
Fax: +49 69 97373 167

**INNOVA Gas Products Sales & Service**
**LumaSense Technologies A/S**
**Energivej 30, DK- 2750 Ballerup**
Tel:+45 44 20 01 00
Fax:+45 44 20 01 01

**info@lumasenseinc.com**

**www.lumasenseinc.com**




Innova-1314i_Datasheet-EN - Rev. 03/27/2015