



Uses:

- Emission monitoring - of exhausts from chemical processes, NH₃ in stacks, scrubber efficiency and filter breakthrough
- 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 NH₃ and N₂O in diesel exhausts

Features:

- Selectively measures a wide range of gases/vapors
- Linear response over a wide dynamic range
- High stability (low drift) makes calibration only necessary one – two times a year
- Extremely reliable due to self-testing procedures
- User-friendly procedures for calibrating the monitor, presenting and analysing measurement data via the PC user-interface
- Accurate - compensates for temperature and pressure fluctuations, water vapor interference and interference from other known gases
- Extremely low-volume flushing possible
- Operates immediately - almost no warm-up time necessary
- Fits in a standard 19 inch rack and collects samples from points up to 50 meters away
- Presents measurement data both in tabular and graphic formats - up to five gas concentration and water vapor graphs displayed, simultaneously

Introduction

The Photoacoustic Multi-gas Monitor – INNOVA 1314 is a highly accurate, reliable and stable quantitative gas monitoring system. It uses a measurement system based on the photoacoustic infra-red detection method, and 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 of these filters in the 1314, it can measure the concentration of up to five component gases and water vapor in any air sample. Although the detection limit is gas-dependent, it is typically in the ppb region. The accuracy of these measurements is ensured by the 1314'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, which the 1314 performs. By the nature of this measurement system, it requires no consumables and very little regular maintenance, for example for most applications recalibration is only necessary one – two times a year.

The monitoring system is easily operated through either of the two user interfaces: the front panel with its push-buttons and display providing short explanatory texts, or the PC Software, with its graphical interface. Both interfaces enable the monitor to be set-up, a measurement sequence started and the resulting concentration values of the specified gases viewed while monitoring.

The monitor is equipped with two standard interfaces: IEEE-488 and RS-232 (optional JV 0901 converter RS-232 to USB). These enable the monitor to be integrated into automated process systems.

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

Selectivity

The gas selectivity of the 1314 is determined by the optical filters installed in its filter wheel.

Because water is nearly always present in ambient air and absorbs infra-red 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, which measures water vapor and enables the 1314 to compensate for water vapor's interference.

By selecting different filters, this technique can also be used to cross-compensate for known interferent gases.

Calibration

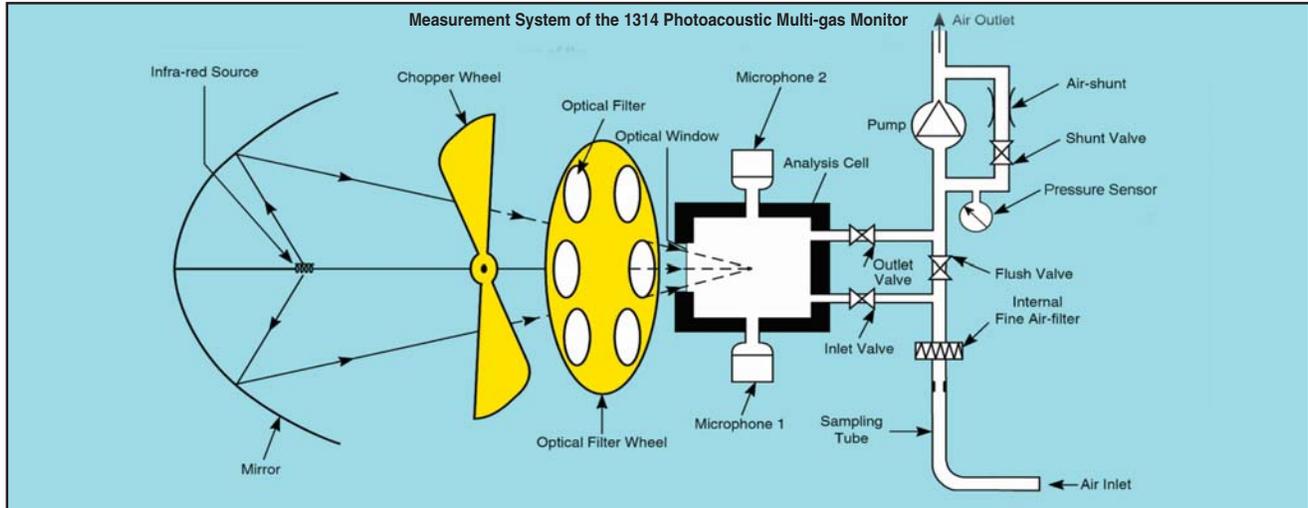
After the relevant optical filters are installed, the monitor must be calibrated. This is achieved through easy-to-use menu driven instructions. With its high stability, calibration of the 1314 is seldom necessary more than once a year.

Calibration is performed using either the PC Software or directly from the front panel.

Operation

The 1314 monitoring system is easy to operate using either the PC Software or the frontpanel 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.

Photoacoustic Multi-gas Monitor – INNOVA 1314



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 analysis 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 down to approx. 13 sec. for one gas or water vapor, or approx. 26 sec. if five gases and water vapor are measured.

Setting-up the Monitor

The Set-up option enables all the parameters necessary to complete the monitoring task to be defined.

Within this option, the *Sample Integration Times (S.I.T.)* is set - enabling measurement results to be weighted - sensitivity against speed.

Starting Measurements

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

Alarms

When measuring, two Alarm trigger levels, which provide high alarm limit one and two for each measured gas, can be defined. These can also be linked to audible alarms.

Measurement Results

On-line Measurements

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 PC Software, the graphs can be set up to display only the desired gases, defined concentration ranges and results from statistical analyses.

Also, when using the PC Software, all measurement data is stored in user-defined databases, in an MS-Access® format.

Off-line Measurements

Gas-measurement result data is displayed on the 1314's screen (display memory) as soon as it is available, and is constantly updated. During a task, the 1314 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, if necessary, be uploaded to the PC Software and printed out in a list form on any standard text printer via the 1314's IEEE and RS-232 (optional JV 0901 converter RS-232 to USB) interfaces.

Reliability

Reliability can be ensured by a series of self tests that the monitor can perform. The self tests check software, data integrity, and the 1314'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 1314 will automatically start-up again when power is restored. Measurement data stored in the monitor's memory is not affected.

Maintenance

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

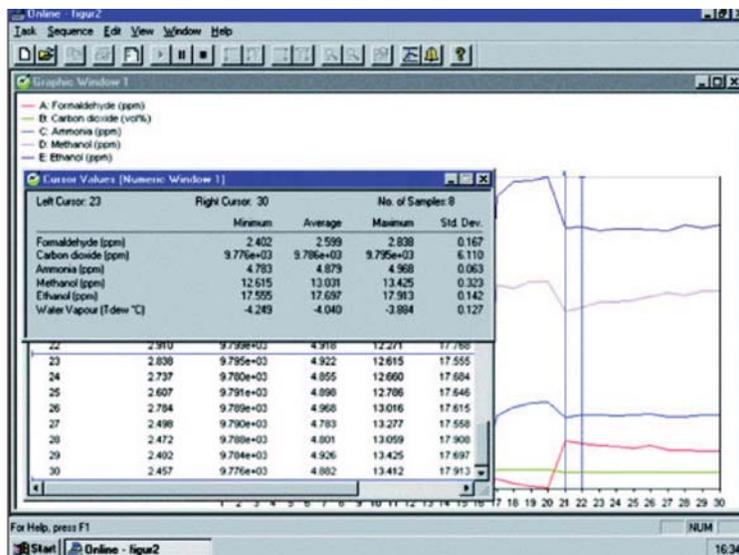


Fig. 1 Displaying detailed measurement data using the cursors in the graphic or table windows.

Remote Control Options

When remote control and multiple sampling points are required, LumaSense Technologies is able to offer an additional application software program, the Application Software – INNOVA 7300. Using this software, a computer can remotely control a 1314 together with one Multipoint Sampler – INNOVA 1309 for sequentially monitoring air-samples from up to 12 locations.

Optional Modules

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

- Analogue/Relay Interface
- Analogue Interface
- Purge Module

These modules must only be installed by LumaSense Technologies.

Analogue/Relay Interface

A 4-20mA or 0-10Volt analogue interface can be installed for each measured gas. In addition, these interfaces provide two alarm relays (for indicating two alarm levels) per gas.

Analogue Interface

A 4-20mA or 0-10Volt analogue interface can be installed for each measured gas. In addition, these interfaces provide two relays for Error and Warning states.

Purge Module

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

Ordering Information

Photoacoustic Multi-gas Monitor – INNOVA 1314

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

Includes following accessories

AT 2177	PTFE tubing
DS 0759B	Particle filter
VF 0087A	Fuse
7304	Gas monitoring SW (CD)
BR 6010	1314 Set-up tree

Mains Cable

WL 0945 RS-232 Interface cable (9pin-25pin) null-modem included
PC Software for Photoacoustic Multi-gas Monitor Instruction Manual (CD Rom)

Optional Accessories

The 1314 can be span-calibrated for certain gases (option UA 1098) - 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	Optical Filters
UA 6008	Optical Filter
UA 6009	Optical Filter
UA 6010	Optical Filter
UA 6016	Optical Filter
UA 1098	Span Calibration

1309
7300
JV 0901
WL 0946

AF 0614
UA 1357A
UA 1365

UA 1363A
UA 1364A

AO 1431A

AO 1432A

JP 0600

JZ 0102A

UA 1361A

Multipoint Sampler
 Application Software
 Converter RS-232 to USB
 RS-232 Interface cable (25pin-25pin) null-modem included
 PTFE tubing
 Genie Membrane separator
 Genie Membrane Separator (inline)
 Analogue Interface Module
 Analogue/Relay Interface Module
 I/O cable one meter (for analogue relay)
 I/O cable three meters (for analogue relay)
 6-pin DIN plug (male) with locking collar for alarm relay
 37-pin Sub-d to 37-pin screw terminal
 Purge Module

Specifications – INNOVA 1314

MEASUREMENT TECHNIQUE:

Photoacoustic infrared spectroscopy.

Your local LumaSense Technologies 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:

Monitor Set-up	Response Times
S.I.T.: "Normal" (5s) Flushing: Auto, (tube 1m)	One gas: ~27s 5 gases + water: ~60s
S.I.T.: "Low Noise" (20s) Flushing: Auto, (tube 1m)	5 gases + water: ~150s
S.I.T.: "Fast" (1s) Flushing: Chamber 4s, Tube "OFF"	One gas: ~13s 5 gases + water: ~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 four 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 five orders of magnitude.

Zero Drift: Typically \pm Detection limit* per three months*.

Influence of temperature*: \pm 10% of detection limit*/°C.

Influence of pressure*: \pm 0.5% of detection limit*/mbar.

Repeatability: 1% of measured value*

Range Drift: \pm 2.5% of measured value per three months*.

Influence of temperature* : 0.3% of measured value/°C.

Influence of pressure* : -0.01% of measured value/mbar.

Reference conditions:

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

♦ Measured at 1013 mbar, and RH: 60%.

♥ Measured at 20°C and RH: 60%.

♣ Detection limit is @5s S.I.T.

Interference:

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

Dependent on the number of gases being measured. Sufficient for a 12-day monitoring task, monitoring five gases and water vapor every 10 min.

GENERAL:

Pumping Rate: 30cm³/s (flushing sampling tube) and 5cm³/s (flushing measurement chamber).

Power Requirement: 100-240VAC, 50-60Hz.

Power Consumption: ~120VA.

Air Volume per sample:

Flushing Settings	Volume of Air
Auto: Tube Length: 1m	140cm ³ /sample
Fixed Time: Chamber 2s, Tube 3s	100cm ³ /sample
Fixed Time: Chamber 2s, Tube "OFF"	10cm ³ /sample

Total Internal Volume: The total Internal Volume of the measurement system: 60cm³.

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

Back-up Battery: 3V lithium battery, life-time five years. This protects data stored in memory, and powers the internal clock.

Dimensions:

Height: 175 mm (6.9 in).

Width: 395 mm (15.6 in).

Depth: 300 mm (11.8 in).

Weight: 9 kg (19.8lbs).

COMMUNICATION:

The monitor has two interfaces, IEEE-488 and RS-232. These are used for data exchange and remote control of the 1314. The PC Software communicates using the RS-232 interface.

PC SOFTWARE REQUIREMENTS:

Hardware:

A Pentium (166MHz) processor or better. Min. 64MB of RAM (depending on Op Sys.). Min. 40MB of space available on the hard disk. One RS-232 port.

Software:

Windows 2000 (min. SP1), NT4.0 (min. SP4), XP (min. SP1).

WARNING!

The 1314 must not be placed in areas with flammable gases/vapors in explosive concentrations, or be used to monitor explosive concentrations of these. Also, monitoring of certain aggressive gases, or a very high concentration of water vapor could damage the 1314. Ask your local LumaSense Technologies representative for further information.



COMPLIANCE WITH STANDARDS:

CE-mark indicates compliance with: EMC Directive and Low Voltage Directive

UL-mark indicates compliance with: UL Standards

Cabinet UL recognized in accordance with UL746

ULR	
Safety	EN/IEC 61010-1, 2 nd (2001): Safety requirements for electrical equipment for measurement, control and laboratory use UL61010A-1 first edition (2002): Electrical Equipment For Laboratory Use; Part 1 General Requirements CAN/CSA-C22.2 No. 1010.1-92: Safety requirements for equipment for measurement, control and laboratory use
EMC	EN 61000-3-2:1995 + A1/A2:98 + A14:00 Harmonic Currents EN 61000-3-3:1995 Voltage Fluctuations EN 55022:1994 + A1:95 + A2:97/EN 55022:1998 Radio disturbance char. – IT equipment EN 55024 : 1998 Immunity Standard – IT equipment EN 61000-4-2:95 Electrostatic Discharge Requirements EN 61000-4-3:96 Radiated Radio-frequency EM Field EN 61000-4-4:95 Electrical Fast Transient/burst Requirements EN 61000-4-5:95 Surge Immunity Test EN 61000-4-6:96 Conducted Disturbances induced by RF Fields EN 61000-4-8:93 Power Frequency Magnetic Field Immunity EN 61000-4-11:94 Voltage dips, Interruptions and Variations
Environment	UL 61010A-1: Environmental conditions Altitude up to 2000 m Operating Temperature: +5°C to +40°C Storage Temperature: -25°C to +55°C Humidity: Maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C Pollution Degree II
Enclosure	IP20

LumaSense Technologies reserves the right to change specifications and accessories without notice.

LumaSense Technologies™ is a Trademark of LumaSense Technologies, Inc. ©2007 LumaSense Technologies, Inc. All rights reserved.



3033 Scott Blvd., Santa Clara, CA 95054

Ph: +1.408.727-1600 Fx: +1.408.727.1677

Energivej 30, 2750 Ballerup, Denmark

Ph: +45 4420 0100

Fx: +45 4420 0101

www.lumasenseinc.com