DATASHEETS

INNOVA 1314i | INNOVA 1403 | INNOVA 1409 | INNOVA 1512 | INNOVA 3433i | INNOVA 3731 | INNOVA 3750-2/3750-5 | INNOVA 3751-2/3751-5

INNOVA 1314i

Highly accurate, reliable, stable, and remote controllable quantitative gas monitoring system

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.

PRODUCT HIGHLIGHTS

- Selectively measures a wide range of gases/vapors
- Linear response over a wide dynamic range
- Stable and reliable: ensuring a maximum of only two calibrations a year
- User-friendly: easy calibration, configuration, and viewing/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 the Innova 1409 Multipoint Sampler: the gas monitor can operate as the system controller for full standalone operation

TYPICAL APPLICATIONS

- 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

AT A GLANCE

Measurement Technique

Photoacoustic Infrared Spectroscopy

Filter Capacity

Up to 5 + water from 27 different filter options

Detection Limit

Gas dependent, but typically in the ppb region

Repeatability

1% of measured value

OVERVIEW

Gas selectivity for the Innova 1314i monitor 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. The detection limit is gas-dependent, but is typically in the ppb region.

Reliability is 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.

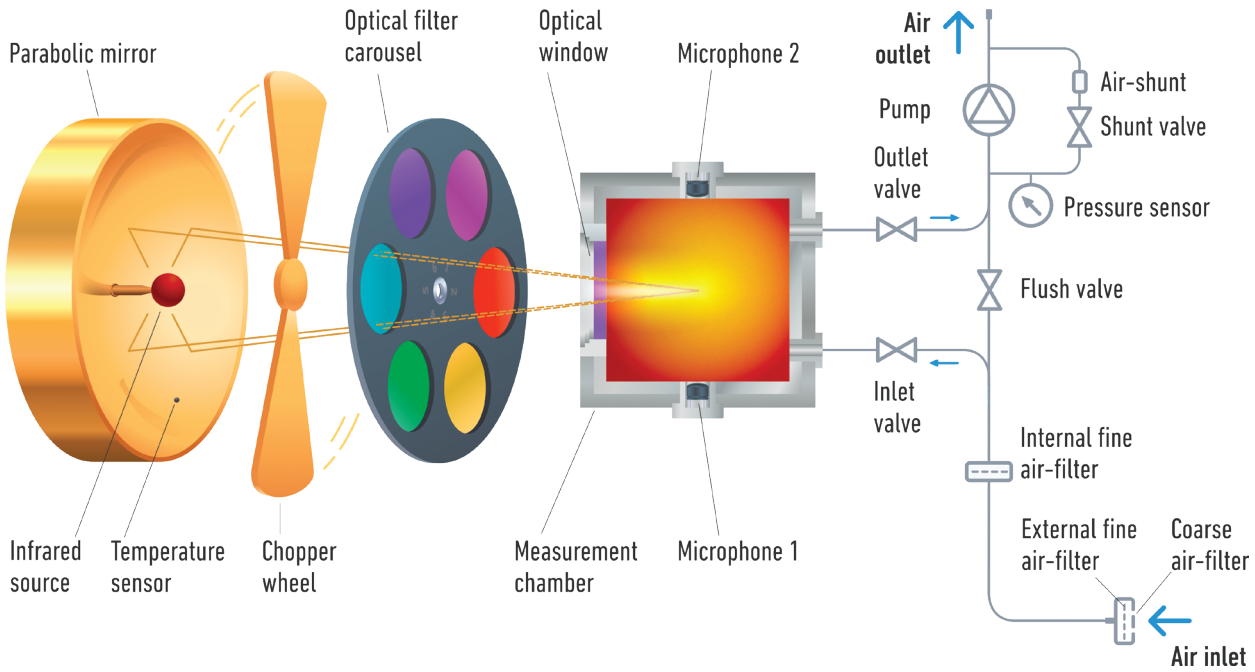
The 1314i measurement system requires no consumables and very little regular maintenance. For most applications, recalibration is only necessary one to two times a year.

The monitoring system is easily operated through either the front panel, with its push-buttons and display providing short explanatory texts, or through the PC software. Both methods 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 RS232. 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 inches rack and has a built-in pump system that allows samples to be drawn from up to 50 meters away.

PHOTOACOUSTIC SPECTROSCOPY (PAS)



MEASURING DETAILS

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's front panel.

Operation

The 1314i monitoring system is easy to operate using either the application software or by using the front panel push-keys (which can be locked and accessed at three levels using passwords). The monitor can be operated as both an online and offline instrument (i.e. standalone operation). 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. When used as a system controller for multipoint monitoring, the same menu enables the setup of the Innova 1409's multipoint sampling tasks.

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 by using a defined stop time.

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 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.

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 allows four alarm levels to be displayed.

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.

TECHNICAL DATA

Measurement Specifications[1]		
Measurement Technique	Photoacoustic infrared spectroscopy	
Response Times	S.I.T.: "Normal" (5 s) Flushing: Auto, (tube 1 m)	One gas: ~27 s
		Five gases + water: 60 s
	S.I.T.: "Low Noise" (20 s) Flushing: Auto, (tube 1 m)	Five gases + water: 150 s
	S.I.T.: "Fast" (1 s) Flushing: Chamber 4 s, (tube "OFF")	One gas: ~13 s
		Five gases + water: 26 s
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 ± Detection limit[1] per three months[2]	
	Influence of temperature[3]	±10% of detection limit[1]/°C
	Influence of pressure[4]	±0.5% of detection limit[1]/mbar
Repeatability	1% of measured value[2]	
Range Drift	±2.5 of measured value per three months[2]	
	Influence of temperature[3]	±0.3% of measured value/°C
	Influence of pressure[4]	-0.01% of measured value/mbar
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 @ 20 Hz can affect the detection limit	
Internal Data Storage Capacity	The total space available in Display Memory to store data is 131,072 measurement cycles. If a measurement cycle takes 15 sec, then the display Memory space will be sufficient for a 22-day monitoring task.	

Environmental Specifications	
Operating Temperature	5 to 40°C (41 to 104°F)
Storage Temperature	-25 to 55°C (-13 to 131°F)
Humidity	Max relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity @ 40°C
Altitude	Up to 2000 m
Other Environment	UL 61010A-1: Environmental conditions
	Pollution Degree 2
	Installation Category II
	Indoor Use
Enclosure	IP 20
Dimensions (W x H x D)	483 mm x 175 mm x 375 mm (19" x 6.9" x 14.8")
Weight	14 kg (30.8 lb)

1 Detection limit is @ 5 s S.I.T.

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

3 Measured @ 1013 mbar and RH: 60%.

4 Measured @ 20°C and RH: 60%.

TECHNICAL DATA (CONTINUED)

Pumping System Specifications		
Pumping Rate	30 cm^3/s (flushing sampling tube)	
	5 cm^3/s (flushing measurement chamber).	
Air Volume Per Sample	**Flushing Settings**	**Volume of Air**
	Auto: Tube Length 1 m	140 cm^3/sample
	Fixed Time: Chamber 2 s, Tube 3 s	100 cm^3/sample
	Fixed Time: Chamber 2 s, Tube "OFF"	10 cm^3/sample
Total Internal Volume	60 cm^3 (of the measurement system)	

Electrical and Communication Specifications	
Power Requirement	100 to 240 VAC ±10%, 50 and 60 Hz
Power Consumption	~85 VA
Alarm Relay Socket	For connection to one or two alarm relays (visual/audio)
	Alarm levels for each gas are user-defined
	System On/Running status available
	Max 25 VDC, max 100 mA
Back-Up Battery	3 V lithium battery, lifetime 5 years. This protects data stored in memory and powers the internal clock.
Monitor Interface	Three interfaces: USB, Ethernet, and RS232, for data exchange and remote control of the instrument
Software Communication	Via USB, Ethernet, or RS232 interface
Computer Requirements	Hardware: 2 GHZ Quad-core or equivalent. Min 512 MB RAM. (4096 MB RAM on Windows 8). Min 500 MB space available on hard drive.
	Software (7820/BZ7002/BZ7003): Windows® 7, 8.1, and Windows® 10

Safety and Standards Specifications	
Safety	EN/IEC 61010-1 3rd Edition
	CAN/CSA C22.2 No. 61010-1-04
	UL 61010-1 3rd Edition
EMC	EN 61326-1:2013: Electrical equipment for measurement, control and laboratory use – EMC requirements; Part 1: General requirements
Standards Compliance	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive
	NEMKO mark indicates compliance with: CSA and UL Standards

Warning

The Innova 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 Advanced Energy sales representative for further information.

MEASUREMENT DATA

Online Measurement Results

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

In the 7820/7880 software, the graphs can be configured to display only the desired gases, defined concentration ranges, and results from statistical analyses. Also, when using the 7880 software, all measurement data is stored in user-defined SQL Server 2014 database.

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

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. The internal memory stores the measurement readings on a gas per gas basis, but also across the sampling channels when applicable.

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.

Remote Control Option

Advanced Energy offers remote control capability through the user's local area network using the LumaSoft Gas Single Point 7820 or Multi Point 7880 software. Online access to the measurement data is available via a built in OPC server (alternatively via Microsoft Excel).

Optional Analog/Relay Interface Module UA1374

The functions of the 1314i can be expanded through the additional Analog/Relay Module UA1374.

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

- 0 to 20 mA, 4 to 20 mA
- 0 to 10 V (0 to 5 V 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 to 20 mA and 0 to 10 V)
Measurement Range	Range and zero-point are scalable in the software. Maximum load resistance on current output is 800 Ω. Minimum load resistance for the voltage output is 1000 Ω.

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

With the Analog/Relay Interface Module, 12 alarm relays can be configured: either as two alarm levels for each gas (plus water) on any active sampling channel, or as alarm relays for selective channels on any monitored gas. Furthermore, two alarm relays are available for warning/error messages and for system watchdog function. Max 25 V DC, Max 100 mA.

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.

ORDERING INFORMATION

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

Included Accessories

- 4 m PTFE tubing (AT 2177)
- Particle filter (DS 0759B)
- Fuse (VF0102A)
- Set-up tree (BR6011)
- Mains cable
- USB cable (AS0001A)
- Calibration software (BZ7002)
- Offline software (BZ7003)
- LumaSoft single point monitoring software (7820)
- Instruction manual

OPTIONS AND ACCESSORIES

Calibrations	
UA0181	Automated Calibration
UA0182	Complex Calibration
UA0183	Advanced Calibration

Optical Filters (27 Options)	
UA0968 to UA0989	UA6009
UA0936	UA6010
UA6008	UA6016
DS0806 Particle filters	

Multiple Point Monitoring	
7880	LumaSoft Gas Multi Point
1409	Multiple Point Sampler

Cables, Adapters, and Tubings	
WL0950-003	RS232 Interface cable (9pin–9pin) null modem
JP0600	6-pin DIN plug (male) with locking collar for alarm relay
AF0614	PTFE tubing
UA 1357A	Genie membrane separator
UA1365	Genie membrane separator (inline)
UA 1373	Analog/relay interface module
JZ0102A	37-pin Sub-d to 37-pin screw terminal (for analog relay)
AO1431A	I/O cable one meter (for analog relay)
AO1432A	I/O cable three meters (for analog relay)
UA 1361A	Purge module

Additional Option

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

ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

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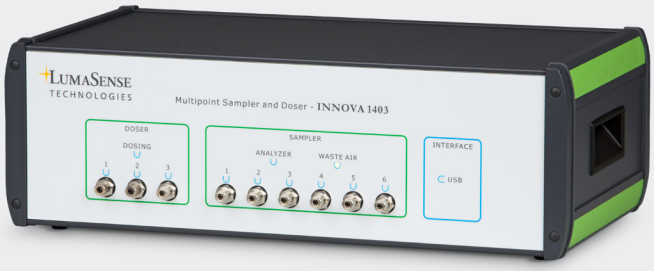
INNOVA 1403

Reliable and easy-to-use multipoint sampler and doser



The Innova® 1403 Multipoint Sampler and Doser is designed to be remote-controlled from a PC using a USB interface with an Innova 1512 or 1412i Photoacoustic Gas Monitor to provide a flexible, sensitive, and accurate monitoringsystem. The 1403 greatly increases the area monitoring capabilities of the gas monitor by drawing air samples through tubing from up to six sampling points, up to 50 m away, and delivering the samples to the gas monitor.

PRODUCT HIGHLIGHTS

- Full remote-control from a PC with 7650 Basic Ventilation Software or 7651 Advanced Ventilation Software
- Automatic calculation of the amount of tracer-gas delivered, to the dosing location
- Factory calibrated dosing system
- Self-test function
- Pneumatic system constructed of AISI-316 Stainless Steel and PTFE tubing to minimize gas absorption

TYPICAL APPLICATIONS

- Air sampling in six locations and delivery to an Innova 1512 or a 1412i Photoacoustic Gas Monitor
- Delivery of tracer gas to up to three locations for ventilation and air-exchange analysis with the Innova 1512 or the 1412i Photoacoustic Gas Monitor

OVERVIEW

Comprehensive air exchange analysis and ventilation efficiency checks are easily performed using the 1403's dosing facilities. Tracer gas is delivered through tubing to "label" the air. The amount of tracer gas delivered is automatically calculated by the 1403. The labeled air is then sampled by the 1403 and delivered to the Gas Monitor for analysis.

The 1403 factory calibration and self-checking routines allow for easy verification of the unit's operation and ensure reliable functioning.

The Innova 1403's pneumatic system is shown in Figure 1. The sampler system is constructed of AISI-316 stainless steel and poly tetrafluoroethylene (PTFE) tubing to minimize absorption of samples. The system has six inlet channels, each with a solenoid valve. Each inlet channel has a tube-mounting stub on the 1403's front plate. Six tubes of up to 50 m connect each channel to the respective sampling point. The six inlet channels converge into one; a three-way valve then directs the gas sample to the 1512 or the 1412i for analysis or through the pump to the waste-air outlet on the 1403's backplate. A pressure transducer checks the efficiency of the sampling pump and allows checks for blocked airways. It is recommended that an air filter is attached to the end of each sampling tube to keep the samples free of particles.

Reliability is ensured by automatic self-tests using both hardware and software. A check of the pneumatic system can be performed on request by the controlling computer. The 1403's operating status is reported to the User Software and any error or warning will be given in a status window on the PC.

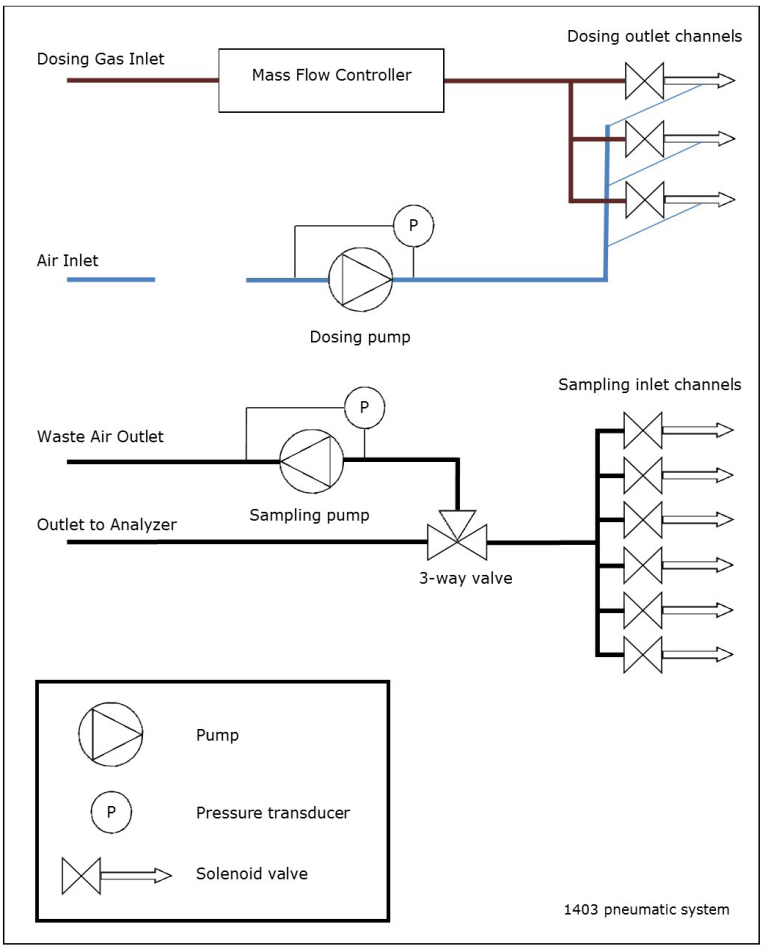


Figure 1: A schematic diagram of the 1403's pneumatic system: the sampler system is depicted at the bottom, the doser system at the top.

SYSTEM DETAILS

The Doser System

The doser system has three outlet channels, each with a solenoid valve. Up to three channels can be selected at a time depending on the given dosing task. The flow through the outlet channel is determined by the Mass Flow Controller (MFC) and is controlled by the User Software. Calibration data for SF_6 and Freon 134a is stored in the User Software.

The dosed amount is determined by the MFC setting. The dosing-gas inlet is pressurized by the tracer gas supply cylinder, which is connected by tubing to the inlet on the 1403's backplate.

The carrier-air inlet pumps extra air to the dosing outlets to speed delivery of the tracer gas to the dosing point. This inlet has a coarse air filter, a pump, and a pressure transducer for checking the efficiency of the pump. Delivering a dose of tracer gas to a dosing point 50 m distant takes one minute. The dosing system can deliver an uninterrupted flow of tracer gas over a period of time. If communication between the system components fails, the selected doser valve will be closed after 60 s.

Calibrating the Doser System

The 1403 is factory calibrated for SF_6 and Freon 134a. By selecting the correct gas, the amount of tracer gas delivered during a dosing procedure can be accurately determined by the Mass Flow Controller in the 1403.

Control of the 1403

The 1403 is fully remote-controlled from a PC using the 7650 Basic Ventilation Software or the 7651 Advanced Ventilation Software. Via the software, the controlling computer communicates with the Gas Monitor over the USB interface. Commands and information requests are sent over the interface to the 1403 to control the sampler system; to setup, and control the dosing system; and to read-out data and command the performance of self tests.

7650 Basic Ventilation Software

The Innova 7650 Basic Ventilation Software allows full coordination and control of all the dosing/sampling and monitoring functions of such systems. The 7650 can control one 1512 or 1412i and a 1403 unit. The 7650 Basic Ventilation Software is able to perform ventilation measurements by controlling both hardware and software in the Innova 1403 Multipoint Sampler and Doser and the Innova 1512 or 1412i Gas Monitor. The user sets up the sampler and the doser unit by selecting up to six sample channels and one out of three doser channels.

Dosing can be either of type pulsed injection for decay measurements or of type constant dose for flow measurements. Measurement is run automatically and the measurement results are presented in numerical and graphical curve views. A graphical curve view is shown in Figure 2.

7651 Advanced Ventilation Software

The optional 7651 Advanced Ventilation Software adds the possibility to use the Constant Concentration Method. It also adds the possibility to use up to three dosing valves when using the Decay or the Constant Concentration Method. The user can select measurement results for further processing by marking a range of measurements in the curve display with two vertical cursors. The marked measurements can be used to calculate parameters like Age of Air, Air Exchange and others.

System Use

The 1403 combined with the 1512 or the 1412i and a controlling computer with 7650 or 7651 Application Software offers wide ranging monitoring capabilities. The 1403 makes it possible to perform air exchange analysis and multi-point monitoring tasks in many different situations and environments, without changing the system components. An example air exchange analysis system is shown in Fig. 3. In such a system, the doser/sampler systems of the 1403 are used as follows. The doser system marks the supply air of the room with a known amount of tracer gas. The sampler system then takes a sample of the return air from the room, and delivers the sample to the Gas Monitor for analysis. While the Gas Monitor performs one analysis, the 1403 takes the next sample for analysis from the room. As the amount of tracer gas delivered to the room is known, and the remaining concentration of tracer gas in the samples is determined by the Gas Monitor, the ventilation system performance can be calculated.

SYSTEM DETAILS (CONTINUED)

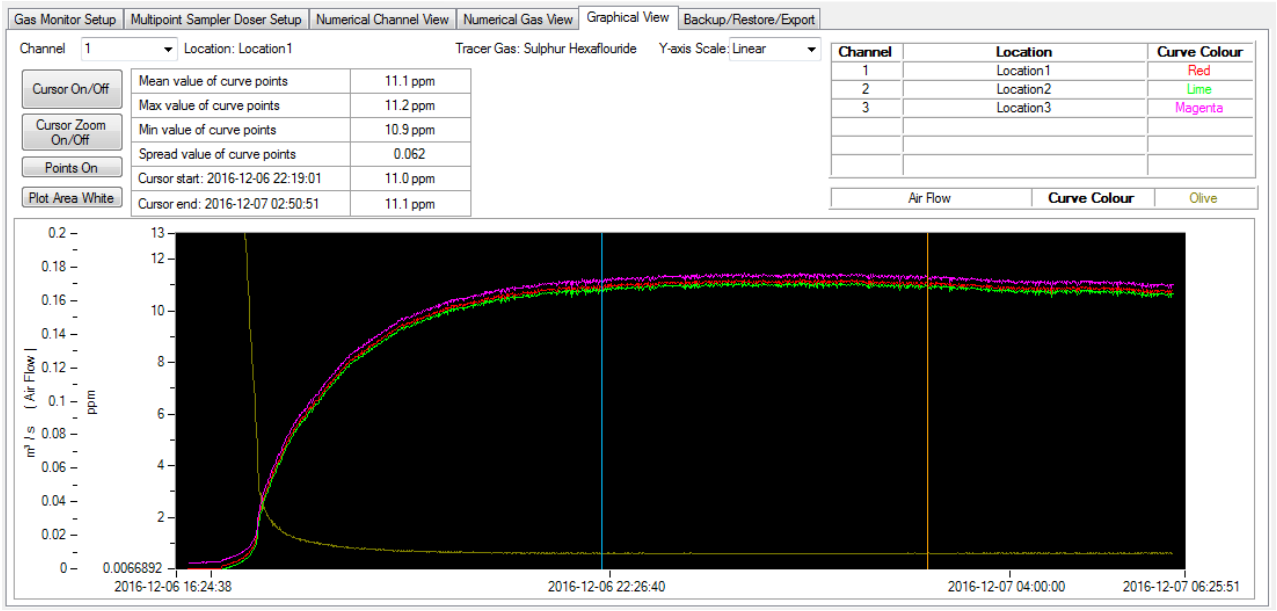


Figure 2: The graphical view with 2 vertical cursors marking a range of measurements

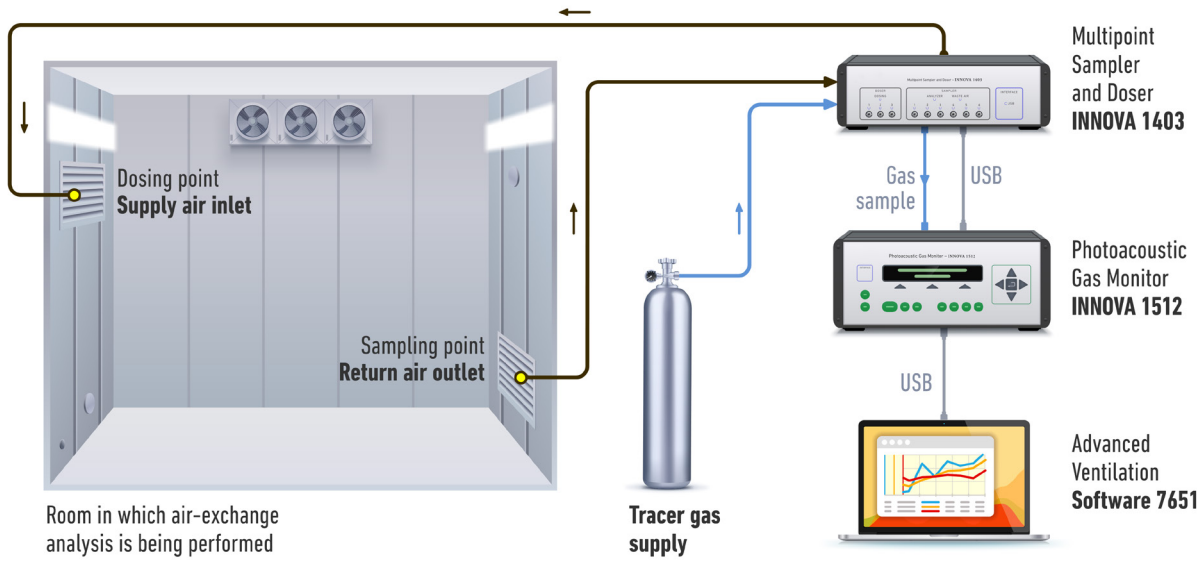


Figure 3: A typical air exchange analysis system shown with an application example. The aim of the analysis is to determine the size of the air change in the mechanically ventilated room. The diagram shows only the dosing and one sampling point for clarity. All functions of the system are controlled by the Application Software. 7650 or 7651.

TECHNICAL DATA

Sampling System (Pump Performance)[1]	
Working Pump Suction	20 kPa
Volume Flow Rate	15 ml/s
Sample Transport Speed	2 m/s
Routing	Three-way valve routes samples either to waste air outlet or to the connected 1512 or 1412i
Minimum Pressure	40 kPa (blocked airways)

Dosing System (Pump Performance)[2]		
Minimum Working Pump Pressure	10 kPa Volume flow rate of supplementary air per dosing channel: 4 ml/s	
Tracer Gas Supply	From pressurized cylinder	
	Supply pressure: 300 k Pa ± 10 % absolute	
Delivery of Tracer Gas	The delivery of tracer gas is controlled by a Mass Flow Controller (3400 Nml/min in N_2)	
Volume Flow Rate	The volume flowrate is variable and is dependent on the selected tracer gas	
	@SF_6	Min approximately 1.4 ml/s
		Max approximately 17.5 ml/s
	@Freon 134a	Min approximately 1.5 ml/s
		Max approximately 18.5 ml/s
Max Delivery Time	1 min (to deliver a dose of tracer gas over a 50 m distance through standard tubing)	
Accuracy of Dosing Calculation	±2%	

Environmental Specifications	
Operating Temperature	5 to 40°C (41 to 104°F)
Storage Temperature	-25 to 55°C (-13 to 131°F)
Humidity	Max relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity @ 40°C
Altitude	Up to 2000 m
Other Environment	UL 61010A-1: Environmental conditions.
	Pollution Degree 2
	Overvoltage Category II
	Indoor Use
Enclosure	IP 40
Dimensions (W x H x D)	445 mm x 155 mm x 260 mm (17.5" x 6.10" x 10.2")
Weight	10 kg (22 lb)

1 Pressure and volume flow data assumes the use of tubing of length 50 m and internal diameter 3 mm

2 Pressure and volume flow data assume the use of Sulphur Hexafluoride (SF_6) or Freon134a (R134a) as tracer gas and Nylon tubing of a length 50 m and internal diameter of 3 mm.

TECHNICAL DATA (CONTINUED)

Electrical and Safety Specifications	
Power Requirement	100 to 240 VAC 50 to 60 Hz
Power Consumption	0.9 A
Safety	EN/IEC 61010-1 3rd Edition
EMC Emission	EN 61326-1:2013: Electrical equipment for measurement, control and laboratory use – EMC requirements; Part 1: General requirements
Standard Compliance	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive

Included Accessories

- Knurled nuts to secure tubing to nozzles (3xYM0652)
- USB interface cable (AS0001)
- 7650 Basic Ventilation Software
- Mains cable
- Instruction manual

Warning

The 1403 must not be placed in areas with flammable gases/vapors in explosive concentrations, or be used for tasks in which explosive concentrations of these gases/vapors are monitored. Also note that certain aggressive gases could damage the internal airways of the 1403. Contact your Advanced Energy sales representative for further information.

ACCESSORIES

PN	Description
7651	Advanced Ventilation Software
AF0614	PTFE tubing
AF0005	Red nylon tubing
AF0006	Green nylon tubing
AF0007	Nylon tubing
UD5023	External air-filter
DS0759	Filters (25) for airfilter unit (UD5023)
AT2247	Nylon tubing for connection of tracer gas supply (1.5 m)
DS2306	Air filter
UD5041	Fitting for DS2306
UM1126	Mass flow controller 700 nml/min in N_2
UM1127	Mass flow controller 5500 nml/min in N_2

ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

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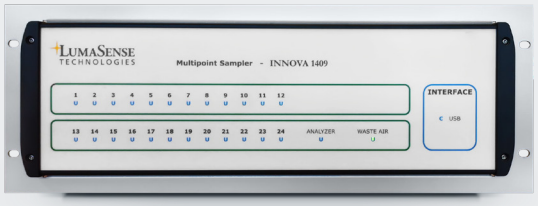
INNOVA 1409

A reliable, fully remote-controlled multipoint gas sampler for up to 24 different locations



The Innova® 1409 multipoint sampler is designed to extend the capabilities of Innova gas monitors. The 1409 is delivered as a 6, 12, or 24 channel multipoint sampler, enabling gas samples to be drawn from up to 24 different sampling locations and delivered to the gas monitor.

PRODUCT HIGHLIGHTS

- Full remote control over the USB interface: the system controller can either be the gas monitor or an online PC
- 6 to 24 sample input channels depending on the configuration
- Self-test function
- Pneumatic system constructed of AISI-316 Stainless Steel and PTFE tubing to minimize gas adsorption
- Integrates seamlessly with the Innova Photoacoustic Gas Monitors
- LED indicators for active channel and interface

TYPICAL APPLICATIONS

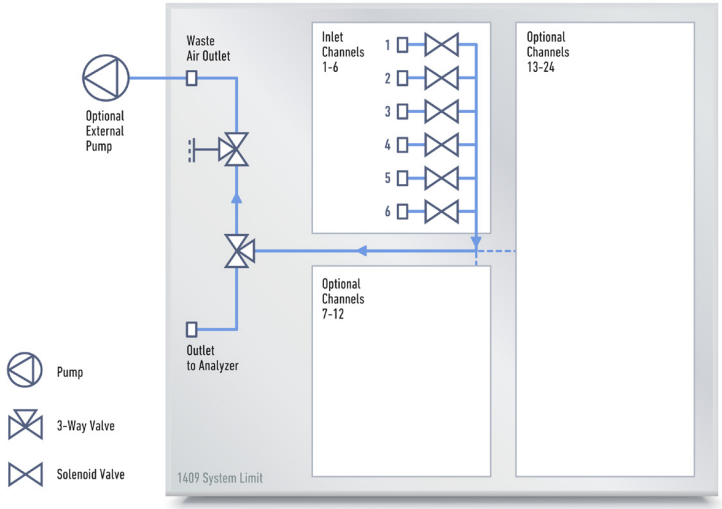
- Occupational safety and health area monitoring - air sampling in up to 24 locations and delivery of the sample to an Innova photoacoustic monitor
- Leak monitoring - air sampling with good spatial distribution (up to 24 sampling points) across large enclosed rooms, and delivering the sample to a central monitor unit
- Multipoint gas analysis - parallel processing of multiple gas cells or chambers with a unique monitor

OVERVIEW

The sampling system is configured from the system controller: either directly via the front panel interface of the gas monitor, or using one of the available software (BZ7007 or LumaSoft 7880). The 1409 communicates with the gas monitor over a USB interface. When using LumaSoft 7880 as a system controller, the computer is connected to the gas monitor via the RS232 serial, USB, or Ethernet interface.

The pneumatic system of the 1409 is shown below. The sampler system is constructed of AISI-316 stainless steel and PTFE (poly-tetrafluoroethylene) tubing to minimize adsorption of samples. The system has 6 to 24 inlet channels depending on the configuration. Each inlet channel has a tubemounting stub on the backplate of the 1409; to connect each channel to the respective sampling point. The 24 inlet channels converge into one; a three-way valve then directs the gas sample to the gas monitor for analysis, or through the external pump (optional) via the waste-air outlet on the 1409's backplate.

The highly efficient 1409's sampler system transports gas samples from the sampling point at approximately four meters per second. This speed depends on the type of pump, the diameter of the tubing, and the length of tubing attached to the 1409. An air filter is attached to the end of each sampling tube to keep the 1409 free of particles.



A schematic diagram of the 1409's pneumatic system. The use of non-reactive materials throughout minimizes gas adsorption in the internal air-channels.

View of the back panel for the 1409-24 Multipoint Sampler. Plug and play design for a seamless integration with the Innova Photoacoustic Gas Monitors

TECHNICAL DATA

Sampler Specifications				
Pump Performance	Two external pumps are available:			
	Pump	**Distance**	**Tube Ø**	**Speed**
	Small	0 to 75 m	3 mm	4 m/s
	Large	75 to 150 m	4 mm	5 m/s
	For tube lengths up to 300 m a pump must be placed in front of each sampling channel.			
USB Interface	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.			
Internal Volume	1409-6	3.6 ml		
	1409-12	5.4 ml		
	1409-24	9.0 ml		

Environmental Specifications		
Operating Temperature	5 to 40°C (41 to 104°F)	
Storage Temperature	-25 to 55°C (-13 to 131°F)	
Humidity	Max relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity @ 40°C	
Altitude	Up to 2000 m	
Other Environment	UL 61010A-1: Environmental conditions.	
	Pollution Degree 2	
	Overvoltage Category II	
	Indoor Use	
Enclosure	IP 40	
Dimensions (W x H x D)	445 mm x 155 mm x 260 mm (17.5" x 6.10" x 10.2")	
Weight	1409-6	6.6 kg (14.6 lb)
	1409-12	7.9 kg (17.4 lb)
	1409-24	10.3 kg (22.7 lb)

Electrical and Safety Specifications	
Power Requirement	100 to 240 VAC 50 and 60 Hz
Power Consumption	0.4 A
Safety	EN/IEC 61010-1 3rd Edition
EMC Emission	EN 61326-1:2013: Electrical equipment for measurement, control and laboratory use – EMC requirements; Part 1: General requirements
Standard Compliance	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive.

Included Accessories

- Knurled nuts to secure tubing to nozzles (3xYM0652)
- USB interface cable (AS0001)
- Remote/offline software (BZ7007)
- Mains cable
- Instruction manual

Warning

The Innova 1409 must not be placed in areas with flammable gases/vapors in explosive concentrations or be used to monitor explosive concentrations of these. Certain aggressive gases can damage the internal airways of the 1409. Contact your Advanced Energy sales representative for further information.

MEASURING DETAILS

Control of the 1409

The 1409 is remotely controlled either by using the gas monitor as a system controller (the monitoring/sampling system then operates in standalone mode), or by LumaSoft 7880 Multipoint Software running on a computer connected to the gas monitor and communicating over the RS232, USB, or Ethernet interface. Commands and information requests are sent over the USB interface to the 1409 to control the sampler system and to read-out data.

System Use

The 1409 combined with a gas monitor offers wide-ranging monitoring capabilities. The 1409 makes it possible to perform multipoint monitoring tasks in a variety of situations and environments, without changing the system components. Air samples are drawn from up to 24 sampling points and delivered to the monitor. The monitor can then measure the concentrations of up to five gases, water vapor, and air pressure in each sample. With its design with a set of 3-way valves, the 1409 sampler can be equipped with an optional external pump: while the gas monitor analyzes the active channel, the system can already sample gas from the next channel in the sequence order.

Setting Up the Sampling Task

The selection of the active channels can be done either directly via the front panel interface of the gas monitor, or using one of the available software (7880 and BZ7007). The 7880 software enables to customize the sampling sequence across the active channels.

Standalone Multipoint Monitoring

Innova Photoacoustics Gas Monitors (1512, 1314i, 1412i, and 3434i) can be setup as a system controller. Their internal CPU is then synchronizing the sampling and gas measurement tasks; it stores the measurement readings in the internal memory on a gas per gas basis, and across the active sampling channels.

Online Multipoint Monitoring

The LumaSoft Gas Multipoint 7880 software offers full coordination and control of all the sampling and monitoring functions of the system. The software coordinates the functions of the instruments to form a monitoring system which, via tubing, can perform gas-monitoring tasks in up to 24 different locations.

When a user sets up a measurement task using the software, the task is performed automatically and measurement data is collected and displayed on the screen. Measurement data is stored in an SQL Server 2014 database, providing easy access to measurement data during a measurement task. The user also has online access to measurement data from Microsoft Excel while a task is running. This makes the data readily available to produce tailor-made reports.

Reliability

Reliability is ensured by automatic self-tests of both hardware and software. The 1409's operating status can be read-out at any time.

Alarm Features

When operating in online multipoint monitoring with LumaSoft 7880, software alarms can be defined for each gas on each channel. In standalone operation with the 1314i Photoacoustic Monitor, alarm relays can be configured as an option, either for each gas on any channel or for selected channels on any gas.

1409 Configurations

The 1409 is delivered in three different configurations.

- 1409-6: with 6 channels
- 1409-12: with 12 channels
- 1409-24: with 24 channels

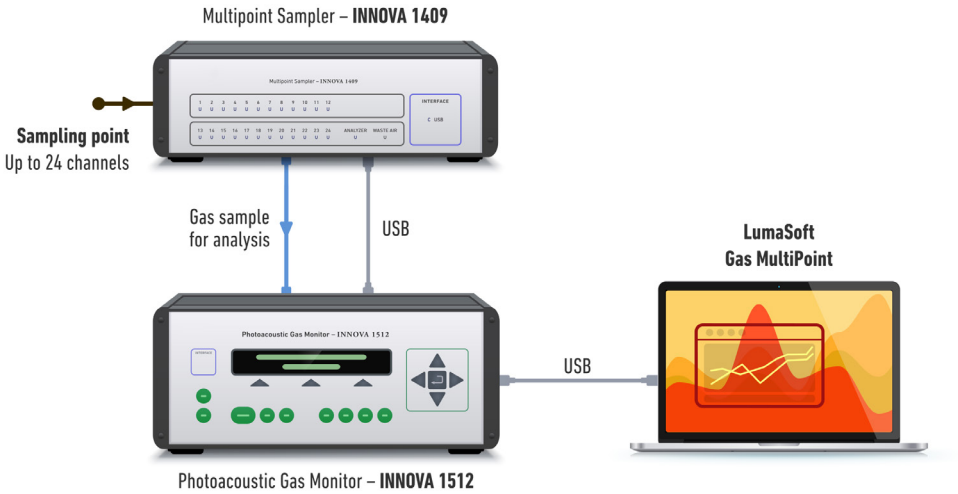
Rack Version

The 1409 can be delivered as a rack version by adding the flange panel for rack mount.

MONITORING SETUPS

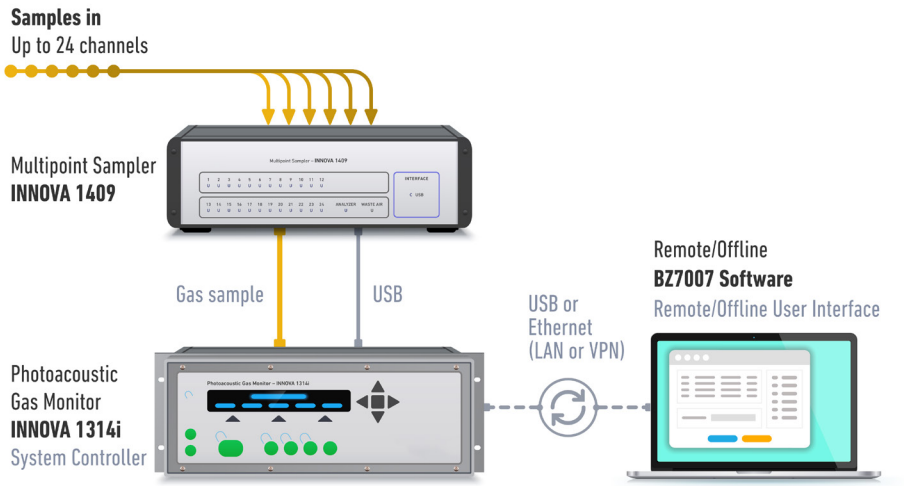
Online Multipoint Monitoring

The Innova 1409 Multipoint Sampler is connected to one Innova Photoacoustic Gas Monitor via USB interface. The system (Sampler + Monitor) is controlled remotely by the LumaSoft Gas Multipoint 7880 software from a PC which can connect to the gas monitor via RS232, USB, or Ethernet. The software provides online monitoring features, including a real-time display of the data.

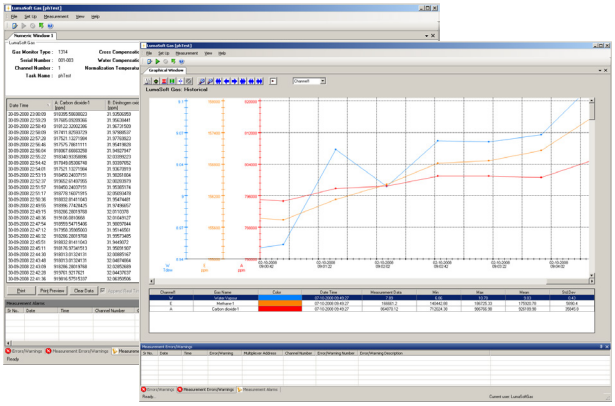


Standalone Multipoint Monitoring

The Innova 1409 Multipoint Sampler is connected to one Innova Photoacoustic Gas Monitor via USB interface. The gas monitor is the system controller for this standalone multipoint monitoring system. The BZ7007 software is a remote and offline user interface which can be used to configure the system (including an optional alarm relay module for the Innova 1314i), or to connect upon need to the system and retrieve the measurement log from the monitor internal memory.

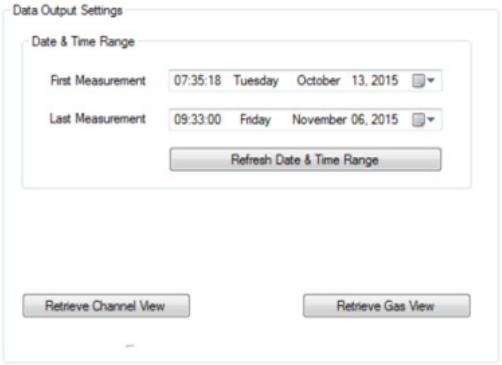


SOFTWARE



LumaSoft 7880

With LumaSoft 7880, the systems operates in online mode with numeric and graphic windows showing the measurement values and other appropriate information for each sample channel and each gas in real time.



BZ7007

When the gas monitor and the 1409 Multipoint Sampler run as a standalone system, the Remote/offline software (BZ7007) can be used to retrieve the measurement log from the monitor's memory and then export it in MS Excel format.

ACCESSORIES

PN	Description
7880	LumaSoft Gas Multi Point Software
EB6000	External pump (small), 230 V
EB6004	External pump (small), 115 V
EB6002	External pump (large), 230 V
EB6003	External pump (large), 115 V
AF0614	PTFE tubing
AF0007	Nylon tubing
UD5023	External air-filter
DS0759	Filters (25) for airfilter unit (UD5023)
UA1365	In line genie membrane separator
DS6015	Membrane replacements (5) for UA1365
EH6039	6-channel nozzle modification kit (to use 4 mm tubing with the 1409).
KS0160	Flange panel for 19" rack mount

ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

PRECISION | POWER | PERFORMANCE

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INNOVA 1512

Highly accurate, reliable, stable, quantitative, and remotely controllable gas monitoring system.

The Innova® 1512 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.

PRODUCT HIGHLIGHTS

- Selectively measures a wide range of gases/vapors
- Linear response over a wide dynamic range
- Stable and Reliable: ensuring a maximum of only two calibrations a year
- User-friendly: easy calibration, configuration, and viewing/analyzing of data via PC
- Accurate: compensates for temperature and pressure fluctuations, water vapor interference, and interference from other known gases
- Extremely low-volume flushing possible
- Operates immediately: virtually no warm-up time necessary
- Remote control capability via TCP/IP network interface protocol
- Expandable up to 24 locations with Innova 1409 Multipoint Sampler: the Gas Monitor can operate as the system controller for full standalone operation

TYPICAL APPLICATIONS

- Occupational Health and Safety measurements – of possible production or accumulation of toxic/ carcinogenic substances in working areas
- Monitoring of anesthetic agents in hospitals
- Emission monitoring of greenhouse gases from agricultural production
- Emission monitoring of exhaust from chemical processes
- Indoor Air Quality (IAQ) measurements
- Ventilation and air exchange using tracer gas

AT A GLANCE

Measurement Technique

Photoacoustic Infrared Spectroscopy

Configuration Options

Available in single gas, dual gas, and 5 gas configuration

Filter Capacity

Up to 5 + water from 27 different filter options

Detection Limit

Gas dependent, but typically in the ppb region

Repeatability

1% of measured value

Multiple Point Monitoring

Optional integration with Innova 1409 Multi Point Sampler for up to 24 channels

OVERVIEW

Gas selectivity for the Innova 1512 monitor is achieved through the use of optical filters. By installing up to five filters, the 1512 can measure the concentration of up to five component gases and water vapor in any air sample. The detection limit is gas-dependent, but is typically in the ppb region. In addition, the 1512 has a built-in pump system that allows samples to be drawn from up to 50 meters away.

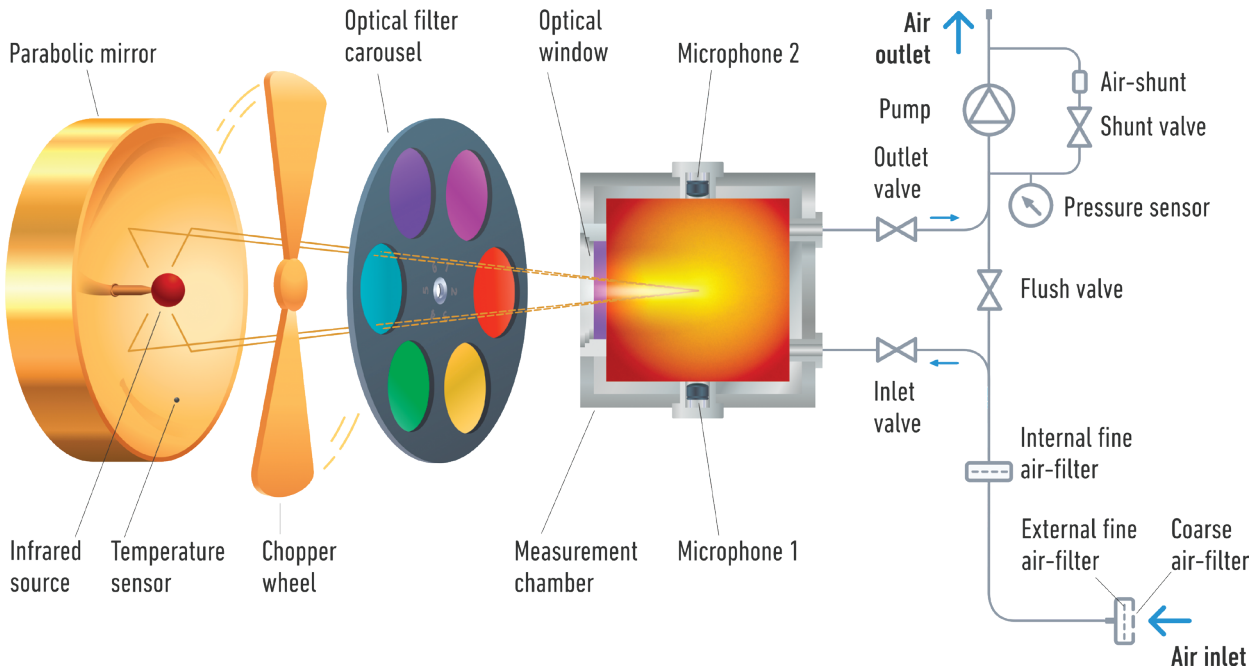
Accuracy of these measurements is ensured by the 1512's ability to compensate for temperature and pressure fluctuations, water vapor interference, and interference from other gases known to be present.

Reliability is ensured by a series of self tests performed by the monitor. The self tests check software, data integrity, and the 1512'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. 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 through the PC software. Both methods 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 RS232. These enable the monitor to be integrated into automated process systems.

PHOTOACOUSTIC SPECTROSCOPY (PAS)



MEASURING DETAILS

Selectivity

The gas selectivity of the 1512 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 1512 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 1512 is seldom necessary more than once a year. Calibration is performed using either the Calibration Software BZ7002 or directly from the 1512 front panel.

Operation

The 1512 monitoring system is easy to operate using either the application software LumaSoft Gas 7820 or 7880 or by using the front panel push-keys (which can be locked and accessed at three levels using passwords). The monitor can be operated as both an online and offline instrument (i.e. standalone operation). 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. When used as a system controller for multipoint monitoring, the same menu enables the setup of the Innova 1409's multipoint sampling tasks.

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 by using a defined stop time.

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 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.

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 7820 or 7880 allows four alarm levels to be displayed.

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.

TECHNICAL DATA

Measurement Specifications[1]		
Measurement Technique	Photoacoustic infrared spectroscopy	
Response Times	S.I.T.: "Normal" (5 s) Flushing: Auto, (tube 1 m)	One gas: ~27 s
		Five gases + water: 60 s
	S.I.T.: "Low Noise" (20 s) Flushing: Auto, (tube 1 m)	Five gases + water: 150 s
	S.I.T.: "Fast" (1 s) Flushing: Chamber 4 s, (tube "OFF")	One gas: ~13 s
		Five gases + water: 26 s
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 ± Detection limit[1] per three months[2]	
	Influence of temperature[3]	±10% of detection limit[1]/°C
	Influence of pressure[4]	±0.5% of detection limit[1]/mbar
Repeatability	1% of measured value[2]	
Range Drift	±2.5 of measured value per three months[2]	
	Influence of temperature[3]	±0.3% of measured value/°C
	Influence of pressure[4]	-0.01% of measured value/mbar
Interference	The 1512 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 1512 can cross compensate for the interferent.	
Acoustic Sensitivity	Not influenced by external sound	
Vibration Sensitivity	Strong vibrations @ 20 Hz can affect the detection limit	
Internal Data Storage Capacity	The total space available in Display Memory to store data is 131,072 measurement cycles. If a measurement cycle takes 15 sec, then the display Memory space will be sufficient for a 22-day monitoring task.	

Environmental Specifications	
Operating Temperature	5 to 40°C (41 to 104°F)
Storage Temperature	-25 to 55°C (-13 to 131°F)
Humidity	Max relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity @ 40°C
Altitude	Up to 2000 m
Other Environment	UL 61010A-1: Environmental conditions
	Pollution Degree 2
	Overvoltage Category II
	Indoor Use
Enclosure	IP 20
Dimensions (W x H x D)	443 mm x 195 mm x 244 mm (17.44" x 7.68" x 9.60")
Weight	11 kg (24.3 lb)

1 Detection limit is @ 5 s S.I.T.

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

3 Measured @ 1013 mbar and RH: 60%.

4 Measured @ 20°C and RH: 60%.

TECHNICAL DATA (CONTINUED)

Pumping System Specifications		
Pumping Rate	30 cm^3/s (flushing sampling tube)	
	5 cm^3/s (flushing measurement chamber).	
Air Volume Per Sample	**Flushing Settings**	**Volume of Air**
	Auto: Tube Length 1 m	140 cm^3/sample
	Fixed Time: Chamber 2 s, Tube 3 s	100 cm^3/sample
	Fixed Time: Chamber 2 s, Tube "OFF"	10 cm^3/sample
Total Internal Volume	60 cm^3 (of the measurement system)	

Electrical and Communication Specifications	
Power Ratings	85 VA, 100 to 240 VAC ± 10%, 50 and 60 Hz, Class 1
Alarm Relay Socket	For connection to one or two alarm relays (visual/audio)
	Alarm levels for each gas are user-defined
	System On/Running status available
	Max 25 VDC, max 100 mA
Back-Up Battery	3 V lithium battery, lifetime 5 years. This protects data stored in memory and powers the internal clock.
Monitor Interface	Three interfaces: USB, Ethernet, and RS232, for data exchange and remote control of the instrument
Software Communication	Via USB, Ethernet, or RS232 interface
Computer Requirements	Hardware: Intel dual-core i3 or compatible. Min 4096 MB RAM. Min 500 MB space available on hard drive
	Software: I7820/7880/BZ7002/BZ7003/7650/7651: Windows® 7, 8.1, and Windows® 10.

Safety and Standards Specifications	
Safety	EN/IEC 61010-1 3rd Edition
	CAN/CSA C22.2 No. 61010-1-04
	UL 61010-1 3rd Edition
EMC	EN 61326-1:2013: Electrical equipment for measurement, control and laboratory use – EMC requirements; Part 1: General requirements
Standards Compliance	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive
	NEMKO mark indicates compliance with: CSA and UL Standards

Warning

The 1512 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 1512. Contact your Advanced Energy sales representative for further information.

MEASUREMENT DATA

Online Measurement Results

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

In the 7820/7880 software, the graphs can be configured to display only the desired gases, defined concentration ranges, and results from statistical analyses. Also, when using the 7880 software, all measurement data is stored in user-defined SQL Server 2014 database.

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

Offline Measurement Results

Gas measurement result data is displayed on the 1512's screen (display memory) as soon as it is available, and is constantly updated. During a task, the 1512 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. The internal memory stores the measurement readings on a gas per gas basis, but also across the sampling channels when applicable.

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.

Remote Control Option

Advanced Energy offers remote control capability through the user's local area network using the LumaSoft Gas Single Point 7820 or Multi Point 7880 software. Online access to the measurement data is available via a built in OPC server (alternatively via Microsoft Excel).

Optional Analog/Relay Interface Module UA1374

The functions of the 1512 can be expanded through the additional Analog/Relay Module UA1374.

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

- 0 to 20 mA, 4 to 20 mA
- 0 to 10 V (0 to 5 V 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 to 20 mA and 0 to 10 V)
Measurement Range	Range and zero-point are scalable in the software. Maximum load resistance on current output is 800 Ω. Minimum load resistance for the voltage output is 1000 Ω.

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

With the Analog/Relay Interface Module, 12 alarm relays can be configured: either as two alarm levels for each gas (plus water) on any active sampling channel, or as alarm relays for selective channels on any monitored gas. Furthermore, two alarm relays are available for warning/error messages and for system watchdog function. Max 25 V DC, Max 100 mA.

ORDERING INFORMATION

Optical filters necessary for the user's monitoring task can be ordered together with the 1512 and installed by Advanced Energy. The 1512 is then delivered zero-point and humidity interference calibrated.

Optical Filters (27 Options)	
UA0968 to UA0989	UA6009
UA0936	UA6010
UA6008	UA6016

Additional Option

The 1512 can be span-calibrated for certain gases – contact your local Advanced Energy representative for details of the gases for which this can be done.

Included Accessories

- 4 m PTFE tubing (AT2177)
- Particle filter (DS0759)
- Fuse (VF0102)
- Mains cable
- Set-up tree (BR6022)
- USB cable (AS0001)
- Calibration software (BZ7002)
- Offline software (BZ7003)
- LumaSoft single point monitoring software (7820)
- Instruction manual

OPTIONS AND ACCESSORIES

Calibrations	
UA0181	Automated Calibration
UA0182	Complex Calibration
UA0183	Advanced Calibration

Multiple Point Monitoring	
1403	Multipoint Sampler and Doser
7650	Basic Ventilation Software (included with the 1403)
7651	Advanced Ventilation Software
7880	LumaSoft Gas Multi Point
1409	Multipoint Sampler

Cables, Adapters, and Tubings	
WL0950-003	RS232 Interface cable (9pin–9pin) null modem
JP0600	6-pin DIN plug (male) with locking collar for alarm relay
AF0614	PTFE tubing
UA1365	Genie membrane separator (inline)
UA1374	Analog/relay interface module
JZ0102	37-pin Sub-d to 37-pin screw terminal (for analog relay)
AO1431	I/O cable one meter (for analog relay)
AO1432	I/O cable three meters (for analog relay)

Multiple Point Monitoring

The Innova 1512 can be integrated with the Innova 1409 Multipoint Sampler to form a monitoring system expandable to up to 24 channels sampled sequentially. The user can decide upon a full standalone operation (the gas monitor is the system controller) or a remote controlled operation from a PC with the LumaSoft 7880 for online monitoring.

ABOUT ADVANCED ENERGY

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INNOVA 3433i

Highly accurate, reliable, and stable quantitative gas monitoring system for automotive monitoring

The Innova® 3433i Photoacoustic Multi-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.

PRODUCT HIGHLIGHTS

- Selectively measures a wide range of gases/vapors
- Linear response over a wide dynamic range
- Stable and Reliable: ensuring a maximum of only two calibrations a year
- User-friendly: easy calibration, configuration, and viewing/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

TYPICAL APPLICATIONS

- Automotive monitoring - of alcohol content in vehicle exhausts and production of NH_3 and N_2O in diesel exhausts
- Automotive SHED evaporative emission testing

AT A GLANCE

Measurement Technique

Photoacoustic Infrared Spectroscopy

Filter Capacity

Up to 5 + water from 27 different filter options

Detection Limit

Gas dependent, but typically in the ppb region

Repeatability

1% of measured value

OVERVIEW

Gas selectivity for the Innova 3433i monitor is achieved through the use of optical filters. By installing up to five filters, the 3433i can measure the concentration of up to five component gases and water vapor in any air sample. The detection limit is gas-dependent, but is typically in the ppb region.

Reliability is ensured by a series of self tests performed by the monitor. The self tests check software, data integrity, and the 3433i'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.

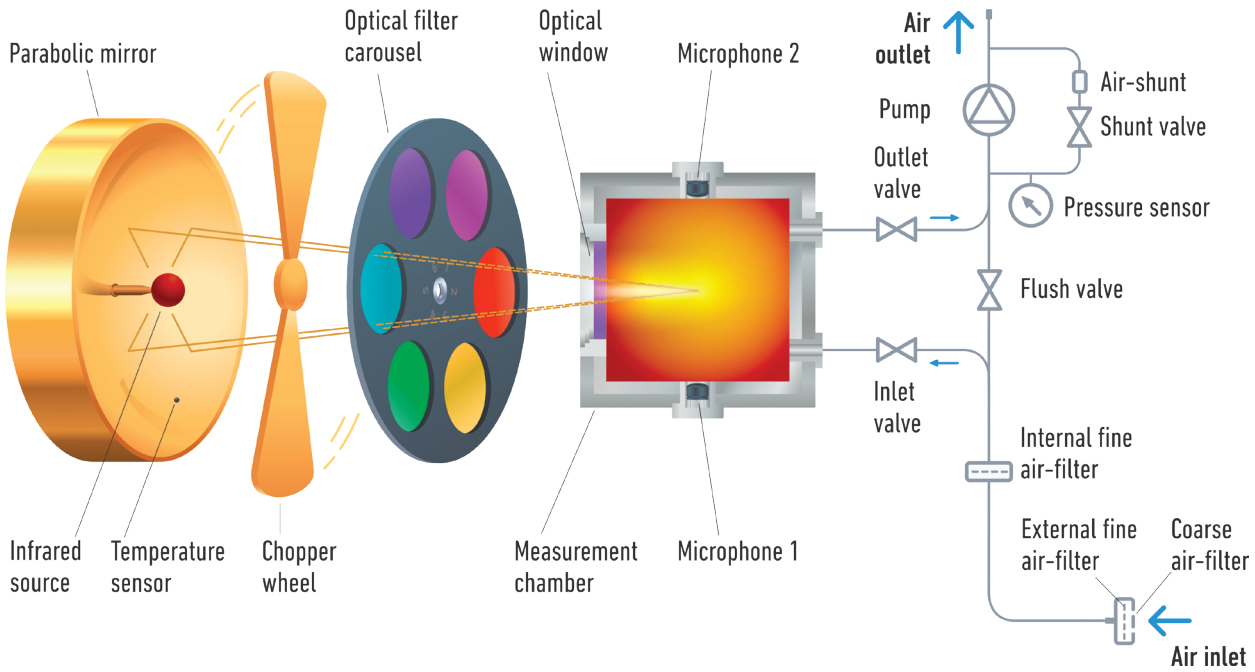
The 3433i measurement system requires no consumables and very little regular maintenance. For most applications, recalibration is only necessary one to two times a year.

The monitoring system is easily operated through either the front panel, with its push-buttons and display providing short explanatory texts, or through the PC software. Both methods 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 RS232. These enable the monitor to be integrated into automated process systems.

To ensure easy placement of the 3433i, it is housed in a rugged box that fits in a standard 19" rack and has a built-in pump system that allows samples to be drawn from up to 50 meters away.

PHOTOACOUSTIC SPECTROSCOPY (PAS)



MEASURING DETAILS

Selectivity

The gas selectivity of the 3433i 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 3433i 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 3433i is seldom necessary more than once a year. Calibration is performed using either the Calibration Software BZ7002 or directly from the 3433i's front panel.

Operation

The 3433i monitoring system is easy to operate using either the application software or by using the front panel push-keys (which can be locked and accessed at three levels using passwords). The monitor can be operated as both an online and offline instrument (i.e. standalone operation). 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.

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 by using a defined stop time.

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 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.

Online Measurement Results

Using the monitor’s standard interface, measurement results are transferred directly to a PC or integrated into the process system.

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.

TECHNICAL DATA

Measurement Specifications[1]		
Measurement Technique	Photoacoustic infrared spectroscopy	
Response Times	S.I.T.: "Normal" (5 s) Flushing: Auto, (tube 1 m)	One gas: ~27 s
		Five gases + water: 60 s
	S.I.T.: "Low Noise" (20 s) Flushing: Auto, (tube 1 m)	Five gases + water: 150 s
	S.I.T.: "Fast" (1 s) Flushing: Chamber 4 s, (tube "OFF")	One gas: ~13 s
		Five gases + water: 26 s
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 ± Detection limit[1] per three months[2]	
	Influence of temperature[3]	±10% of detection limit[1]/°C
	Influence of pressure[4]	±0.5% of detection limit[1]/mbar
Repeatability	1% of measured value[2]	
Range Drift	±2.5 of measured value per three months[2]	
	Influence of temperature[3]	±0.3% of measured value/°C
	Influence of pressure[4]	-0.01% of measured value/mbar
Interference	The 3433i 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 3433i can cross compensate for the interferent.	
Acoustic Sensitivity	Not influenced by external sound	
Vibration Sensitivity	Strong vibrations @ 20 Hz can affect the detection limit	
Internal Data Storage Capacity	The total space available in display memory to store data is 131,072 measurement cycles. If a measurement cycle takes 15 sec, then the display memory space will be sufficient for a 22-day monitoring task.	

Environmental Specifications	
Operating Temperature	5 to 40°C (41 to 104°F)
Storage Temperature	-25 to 55°C (-13 to 131°F)
Humidity	Max relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity @ 40°C
Altitude	Up to 2000 m
Other Environment	UL 61010A-1: Environmental conditions
	Pollution Degree 2
	Installation Category II
	Indoor Use
Enclosure	IP 20
Dimensions (W x H x D)	483 mm x 175 mm x 375 mm (19" x 6.9" x 14.8")
Weight	14 kg (30.8 lb)

1 Detection limit is @ 5 s S.I.T.

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

3 Measured @ 1013 mbar and RH: 60%.

4 Measured @ 20°C and RH: 60%.

TECHNICAL DATA (CONTINUED)

Pumping System Specifications		
Pumping Rate	30 cm^3/s (flushing sampling tube)	
	5 cm^3/s (flushing measurement chamber)	
Air Volume Per Sample	**Flushing Settings**	**Volume of Air**
	Auto: Tube Length 1 m	140 cm^3/sample
	Fixed Time: Chamber 2 s, Tube 3 s	100 cm^3/sample
	Fixed Time: Chamber 2 s, Tube "OFF"	10 cm^3/sample
Total Internal Volume	60 cm^3 (of the measurement system)	
Inlet and Outlet Fittings	6.34 mm (1/4")	

Electrical and Communication Specifications	
Power Requirement	100 to 240 VAC ±10%, 50 and 60 Hz
Power Consumption	~85 VA
Back-Up Battery	3 V lithium battery, lifetime 5 years. This protects data stored in memory and powers the internal clock.
Monitor Interface	Three interfaces: USB, Ethernet, and RS232, for data exchange and remote control of the instrument
Software Communication	Via USB, Ethernet, or RS232 interface
Computer Requirements	Hardware: Pentium processor 2 GHZ Quad-core or equivalent. Min 512 MB RAM. (4096 MB RAM on Windows 8). Min 500 MB space available on hard drive.
	Software (7820/BZ7002/BZ7003): Windows® 7, 8.1, and Windows® 10

Safety and Standards Specifications	
Safety	EN/IEC 61010-1 3rd Edition
	CAN/CSA C22.2 No. 61010-1-04
	UL 61010-1 3rd Edition
EMC	EN 61326-1:2013: Electrical equipment for measurement, control and laboratory use – EMC requirements; Part 1: General requirements
Standards Compliance	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive
	NEMKO mark indicates compliance with: CSA and UL Standards

Warning

The Innova 3433i 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 3433i. Contact your Advanced Energy sales representative for further information.

ORDERING INFORMATION

Optical filters necessary for the user's monitoring task can be ordered together with the 3433i and installed by Advanced Energy. The 3433i is then delivered zero-point and humidity interference calibrated.

The 3433i is typically configured with two different sets of optical filters, depending on the type of application.

Included Accessories

- Fuse (VF0102A)
- Mains cable
- USB cable (AS0001A)
- LumaSoft single point monitoring software (7820)
- Set-up tree (BR6022)
- Calibration software (BZ7002)
- Offline software (BZ7003)
- Instruction manual

Automotive Exhaust Emissions	
Filter PN	**Gas Detected**
UA0976	Ammonia
UA0985	Nitrous Oxide
UA0974	Ethanol
UA0983	Carbon Dioxide
UA0984	Carbon Monoxide

SHED Evaporative Emissions	
Filter PN	**Gas Detected**
UA0936	Methanol
UA0974	Ethanol
UA0981	Toluene
UA0983	Carbon Dioxide
UA0971	Freon R134A

OPTIONS AND ACCESSORIES

Calibrations	
UA0181	Automated Calibration
UA0182	Complex Calibration
UA0183	Advanced Calibration

Additional Optical Filters	
UA0968 to UA0989	UA6009
UA0936	UA6010
UA6008	UA6016
DS0806 Particle filters	

Cables, Adapters, and Tubings	
WL0950-003	RS232 Interface cable (9pin–9pin) null modem
JP0600	6-pin DIN plug (male) with locking collar for alarm relay
AF0614	PTFE tubing
UA1365	Genie membrane separator (inline)
UA1374	Analog/relay interface module
JZ0102	37-pin Sub-d to 37-pin screw terminal (for analog relay)
AO1431	I/O cable one meter (for analog relay)
AO1432	I/O cable three meters (for analog relay)

Additional Option

The 3433i can be span-calibrated for certain gases – contact your local Advanced Energy representative for details of the gases for which this can be done.

STANDARD MODULES

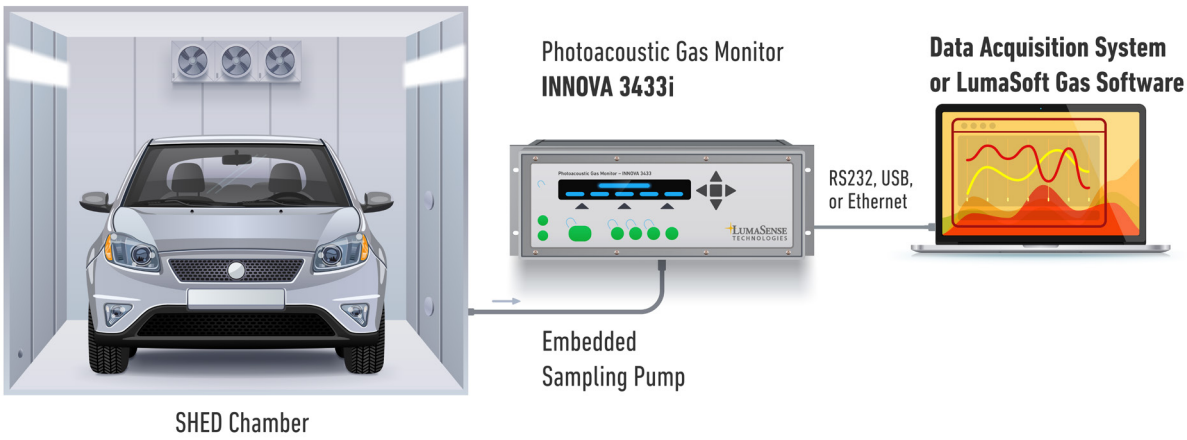
Cushion Pump Module

The 3433i is fitted with a cushion pump modules which reduce the noise from the pump when the 3433i is operated in the continuously pumping sequence mode. This module includes stainless steel tubing from the gas inlet to the measurement chamber.

Purge Module

The 3433i is fitted with a”sealed box” which ensures that the measurement system inside the 3433i can be purged using an inert gas. The Purge Inlet is fitted with a ¼” tube fitting.

MONITORING SYSTEM SET-UP



ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

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+1 970 221 0108

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INNOVA 3731

SF_6 leak detection system for enclosed GIS substations.

The Innova® 3731 SF_6 leak detection system uses Photocaoustic Spectroscopy (PAS) for highly accurate, reliable, and stable quantitative gas detection. The Innova 3731 system leverages more than 20 years of leadership on the ultra-sensitive photoacoustic sensing technique to provide a direct and integral leak detection solution capable of monitoring large switchgear rooms.

PRODUCT HIGHLIGHTS

- Standalone Multipoint SF_6 leak monitor with superior photoacoustic detection (detection limit = 6 ppb)
- Cost-effective solution for a direct and integral leak detection method applicable to a complete SF_6-GIS
- Independent from any pressure or density reading
- Available in 12- or 24-channel configuration to monitor large GIS installation
- Simple installation procedure, not requiring any outage on your installation
- Highly reliable and stable for a low cost of ownership

AT A GLANCE

Measurement Technique

Photoacoustic Infrared Spectroscopy

Filter Capacity

Up to 5 + water

Detection Limit

Gas dependent, but typically in the ppb region

Repeatability

1% of measured value

OVERVIEW

Regulatory frames, like the European F-Gas Directive (EC 517/2014), are mandating the use of leak detection systems in the vast majority of high-voltage SF_6-GIS installations in order to better mitigate the risk of SF_6 emissions. Specifically, when the existing gas instrumentation is not accurate enough to provide early detection: pressure/density switches used for safety considerations (to prevent catastrophic failure) lack of sensitivity and manual leak checks only provide discrete check points. Instead, stationary leak detection systems enable a permanent monitoring and early warning in the case of a leakage event occurring.

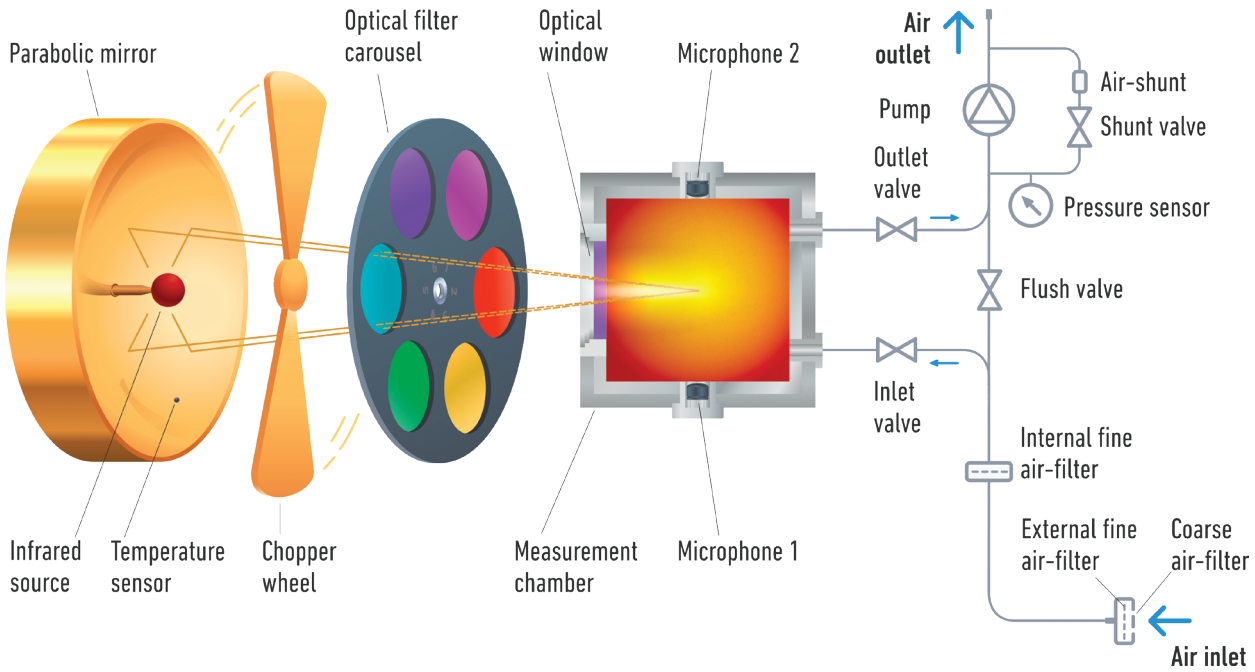
The Innova 3731 system leverages more than 20 years of leadership on the ultra-sensitive photoacoustic sensing technique to provide a direct and integral leak detection solution capable of monitoring large switchgear rooms. The system verifies that the GIS Equipment operates below the industrial target of 0.5% yearly leakage rate or better.

The 3731 system can detect—with a short response time—any excessive increase in the leak rate, enabling to decrease the number of periodic leak checks while providing early leak detection.

Multipoint Sampling

With a multipoint sampler for up to 24 different channels, the 3731 system enables an extensive distribution of sampling points over the whole enclosed substation in order to maximize the coverage area and minimize the detection response time. The length of each individual channel can be extended up to 75 m.

PHOTOACOUSTIC SPECTROSCOPY (PAS)



MEASURING DETAILS

Operation

The Innova 3731 leak detection system operates in standalone mode using the gas monitor as the system controller. It self-synchronizes the monitoring and sampling tasks. The system follows a fixed sampling sequence, measuring the active sampling channels in their basic order. The user can define a fixed interval in between two sequences.

Setting Up the System

The monitor and sampler units are rack-mountable on a standard 19" chassis. The user decides where the measurement points should be located and connects the sampler unit to each location with tubing. A short tubing piece connects the sampler's outlet to the monitor's inlet. The units communicate via USB interface.

Setting up the tasks of the leak detection system is easy using either the remote/offline software (BZ7007) or the front panel push-keys (which can be locked and accessed at three levels using passwords). Using these user-interfaces with their logical division of information, everything that needs to be defined is achieved prior to starting the multipoint monitoring task.

Within the setup tree, the Sample Integration Time (S.I.T.) is set, enabling measurement results to be weighted—sensitivity versus speed.

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 by using a defined stop time.

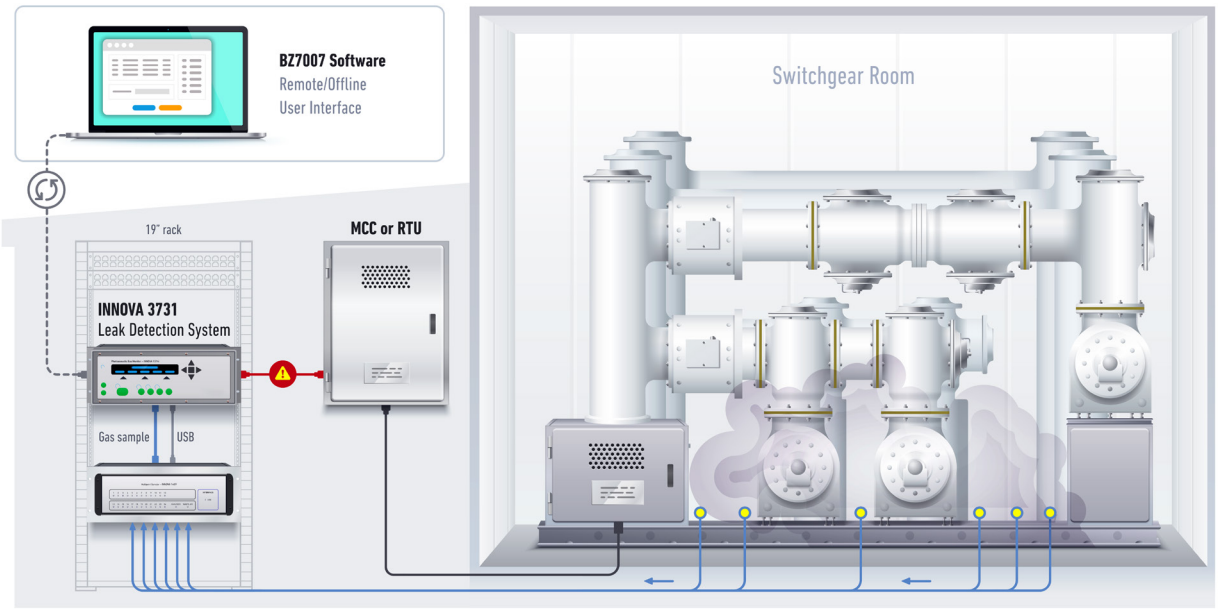


Figure 1: The Innova 3731 SF_6 leak detection system features ultra-high sensitivity with state-of-the-art photoacoustic monitor. It draws air samples from up to 24 locations for maximum coverage of the GIS substation. Tubing lines can easily run into existing control cable trays, or trenches. Analog and alarm relay outputs can be connected to local RTU.

TECHNICAL DATA

Measurement Specifications		
Measurement Technique	Photoacoustic infrared spectroscopy	
	The UA0988 optical filter is installed to measure SF_6.	
Response Times	Is dependent on the Sample Integration Time (S.I.T.) and the flushing time defined	
	S.I.T.: "Normal" (5 s) Flushing: Auto, (tube 1 m)	One gas: ~27 s
		One gas + water: 40 s
	S.I.T.: "Low Noise" (20 s) Flushing: Auto, (tube 1 m)	One gas + water: 70 s
	S.I.T.: "Fast" (1 s) Flushing: Chamber 4 s, (tube "OFF")	One gas: ~13 s
		One gas + water: 22 s
Detection Limit	0.006 ppm @ 5 S.I.T	
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 ± Detection limit[1] per three months[2]	
	Influence of temperature[3]	±10% of detection limit[1]/°C
	Influence of pressure[4]	±0.5% of detection limit[1]/mbar
Repeatability	1% of measured value[2]	
Range Drift	±2.5 of measured value per three months[2]	
	Influence of temperature[3]	±0.3% of measured value/°C
	Influence of pressure[4]	-0.01% of measured value/mbar
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 @ 20 Hz can affect the detection limit	
Internal Data Storage Capacity	The total space available in display memory to store data ia 131072 measurement cycles. One cycle is measurement of SF_6 and water vapor on a given channel.	

Environmental Specifications	
Operating Temperature	5 to 40°C (41 to 104°F)
Storage Temperature	-25 to 55°C (-13 to 131°F)
Humidity	Max relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity @ 40°C
Altitude	Up to 2000 m
Other Environment	UL 61010A-1: Environmental conditions
	Pollution Degree 2
	Installation Category II
	Indoor Use
Enclosure	IP 20
Dimensions (W x H x D)	483 mm (19") x 4U (monitor) + 4U (sampler) x 375 mm (14.8")
Weight	24.5 kg (53.5 lb)

1 Detection limit is @ 5 s S.I.T.

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

3 Measured @ 1013 mbar and RH: 60%.

4 Measured @ 20°C and RH: 60%.

TECHNICAL DATA (CONTINUED)

Pumping System Specifications		
Pumping Rate	30 cm^3/s (flushing sampling tube)	
	5 cm^3/s (flushing measurement chamber).	
External Pump Performance	Distanceup to 75 m, Tube ID 3 mm, Speed 4 m/s	
Air Volume Per Sample	**Flushing Settings**	**Volume of Air**
	Auto: Tube Length 1 m	140 cm^3/sample
	Fixed Time: Chamber 2 s, Tube 3 s	100 cm^3/sample
	Fixed Time: Chamber 2 s, Tube "OFF"	10 cm^3/sample
Total Internal Volume	60 cm^3 (of the measurement system)	

Electrical and Communication Specifications	
Power Requirement	100 to 240 VAC ±10%, 50 to 60 Hz
Power Consumption	~135 VA (monitor and sampler)
Alarm Relay Socket	For connection to one or two alarm relays (visual/audio)
	Alarm levels for each gas are user-defined
	System On/Running status available
	Max 25 VDC, max 100 mA
Back-Up Battery	3 V lithium battery, lifetime 5 years
Monitor Interface	Three interfaces: USB, Ethernet, and RS232, for data exchange and remote control of the instrument
Software Communication	Via USB or Ethernet interface
Computer Requirements	Hardware: Pentium processor 2 GHZ Quad-core or equivalent. Min. 512 MB RAM. (4096 MB RAM on Windows 8). Min 500 MB space available on hard disk.
	Software (BZ7002/BZ7007): Windows® 7, 8, 8.1, and Windows® 10

Safety and Standards Specifications	
Safety	EN/IEC 61010-1 3rd Edition: Safety Requirements for electrical equipment for measurement, control, and laboratory use
EMC	EN 61326-1:2013: Electrical equipment for measurement, control and laboratory use – EMC requirements; Part 1: General requirements
Standards Compliance	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive

Warning

The Innova 3731 system 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 system. Contact your Advanced Energy sales representative for further information.

Scope of Delivery

- Photoacoustic gas monitor with analog/relay module
- Multipoint sampler
- External pump
- Nylon tubing (20 m per channel)
- Airfilter with fittings
- Remote/offline and calibration software
- User manuals

Optional Accessories

- LumaSoft Gas Multi-Point software (online monitoring)

Note

The gas monitor is delivered with the UA0988 optical filter installed. It also features zero-point, humidity interference, SF_6, and water vapor scan calibration.

ADDITIONAL SYSTEM DETAILS

Offline Measurement Results (Standalone Operation)

Gas measurement result data is displayed on the monitor's screen (Display Memory) as soon as it is avail-able, and is constantly updated.

The internal database structures the measurement readings on a gas per gas basis, and across the sampling channels. 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 also be recalled to Display Memory.

From this memory, data can be exported via the Remote/Offline Software in either excel or text file format.

Remote Control Option

The 3731 system offers remote control capability through the user's LAN, USB, or RS232 interfaces using the optional LumaSoft Gas Multi Point 7870 software. This option enables the online monitoring of the leak detec-tion system. The user-friendly interface of the LumaSoft 7870 can provide real time graphical display of the measurements on a channel-per-channel basis. The online software opens a SQL database to log the measurement values.

Analog and Alarm Relay Outputs

The 3731 system features an analog/relay module with analog output (0-10 V, or 4-20 mA) for detection trending and 12 configurable alarm relay outputs for more detailed reporting of alarm conditions. Furthermore, two outputs are also available for relaying warning/error flags and for system watchdog function.

In particular, the Channel Mode is useful for multi-zone monitoring applications with the need to alarm on a zone-by-zone basis. Alarm relays are attributed to one or multiple sampling channels (defining a specific zone) and will trigger upon detection of alarm concentration on any of the monitored gas (for that zone). The Remote/Offline BZ7007 software enables the setup of the alarm levels and of the relay module.

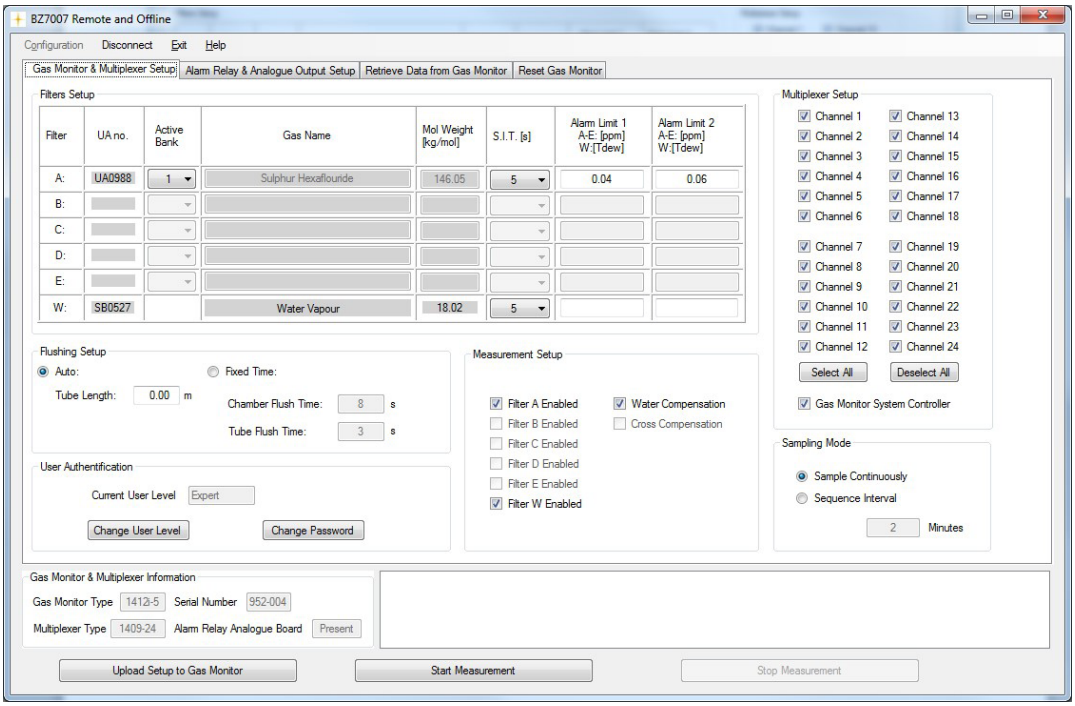


Figure 2: User interface window from the BZ7007 for the complete setup of the monitoring and sampling tasks to be performed by the standalone measurement system. It also reports the current status of the system to which it is connected, and enables the user to start/stop the measurement task.

ADDITIONAL SYSTEM DETAILS (CONTINUED)

Reliable by Design

The leak detector's extended self-test routines maintain the reliability of the results, which are stored in the internal memory of the gas monitor and can be downloaded as required. Alarm relays are available to report any warning/error on the system to the end user.

If the power supply fails, the 3731 system will automatically restart when power is restored. Measurement data stored in the monitor's memory is not affected by power loss.

Selectivity and Accuracy

The monitor is permanently fitted with a special filter that measures water vapor and enables the monitor to compensate for water vapor interference. Additional auto-compensation for temperature and pressure fluctua-tions helps to achieve exceptional accuracy.

Calibration

Calibration is performed using either the Calibration Software BZ7002 or directly from the front panel using the easy-to-use menu-driven instructions.

Detection Trending and Automatic Alarms

Analog output is available for detection trending over time. Measurements are also stored in the internal memory and can be exported to a remote LAN computer via user-friendly software interface. Finally, configurable zone alarms can be relayed to a local RTU.

Low Maintenance

It is only recommended to calibrate the gas monitor only once per year. The calibration can be done without the requirement of an equipment outage. The only other maintenance task necessary is changing the air filter on each active sampling channel.

OPTIONS AND ACCESSORIES

Multiple Point Monitoring	
7880	LumaSoft Gas Multi Point (online monitoring)

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With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

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ENG-Innova3731-235-01 8.19

Application Software for Remote Control of a Photoacoustic Gas Monitor and a Multipoint Sampler and Doser

Advanced Ventilation Software 7651

- Synchronizes the functions of a Sampler and Doser unit to the measurement cycle of a Gas Monitor
- Flexibility in the choice of tracer gas, SF_6 or Freon 134a
- Stores up to five gas concentrations, air humidity and amount of tracer gas delivered
- Enabling all tracer gas methods: concentration decay, constant injection and constant concentration
- Calculates air exchange, age-of-air and air flow in ducts
- Up to nine curves can be shown, allowing direct comparison of results from different locations

The Advanced Ventilation Software 7651 from LumaSense Technologies enables remote control of a 1512 or a 1412i Photoacoustic Gas Monitor and a 1403 Multipoint Sampler and Doser unit. The software coordinates the functions of the instruments to form a monitoring system which, via tubing, can perform ventilation and air exchange measurements. The system can also perform gas-monitoring tasks in up to 6 different locations.

When the user configures a measurement task using the software, the task is performed automatically and the data is collected and displayed on the screen. When the measurement is complete and during measurement, the data processing facilities of the software are used to calculate the parameters that the user requires.

Getting Started

The Gas Monitor and Sampler and Doser unit are connected to the computer via USB.

The user decides where the measurements will be performed and connects the Sampler and Doser unit to these locations with tubing. The locations can then be "dosed" with tracer gas, and air samples can be taken to be analyzed by the Gas Monitor (see Figure 1).

The user starts the 7651 software and selects the type of measurement task to be performed. This can be either a ventilation measurement task, using both the doser and the sampler functions on the 1403 unit, or a multipoint gas monitoring task, using only the sampler system of the 1403 unit.

Application Areas:

- Ventilation and air exchange measurements using tracer gases in up to 3 locations
- Flow in ducts
- Multi-gas monitoring in up to 6 locations
- Tracking of pollutant spread
- Multi Gas Monitoring e.g. Freon 134a and CO_2 as complimentary marker in indoor air quality applications

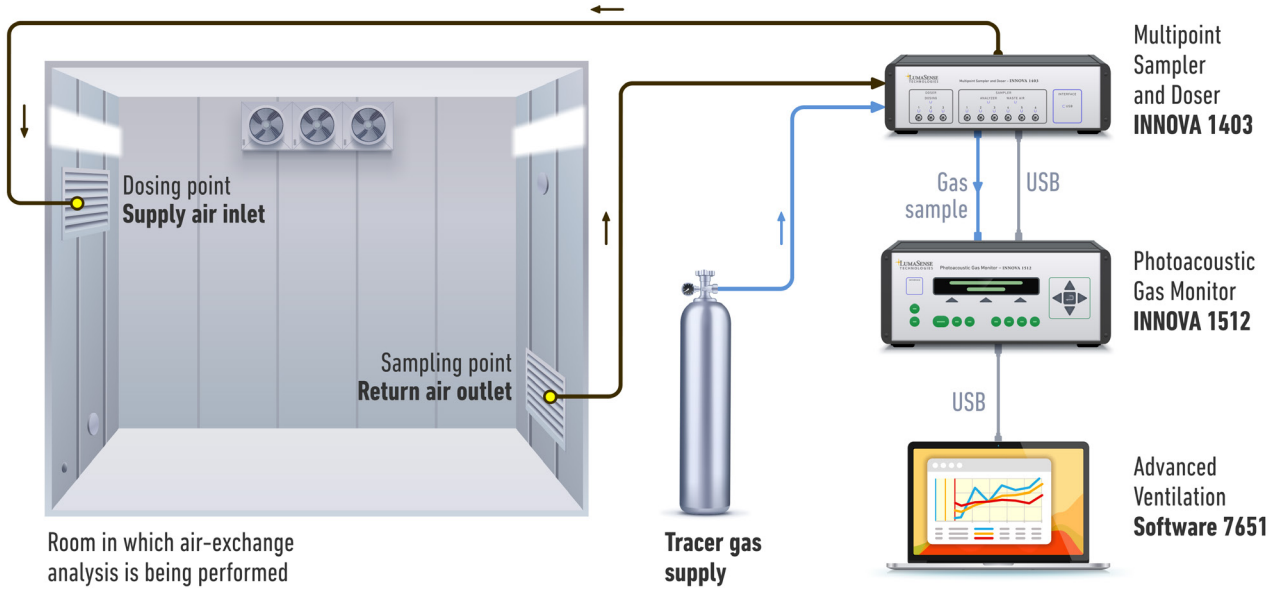

Figure 1: The 1512 Photoacoustic Gas Monitor and 1403 Multipoint Sampler and Doser unit are connected to the computer via USB. The user decides where the measurements will be performed and connects the Sampler and Doser unit to these locations with tubing. The locations can then be "dosed" with tracer gas, and air samples can be taken to be analyzed by the Gas Monitor.

Measurement Modes

Ventilation Measurement Tasks

The 7651 enables comprehensive ventilation measurements. The use of a Multipoint Sampler and Doser unit allows up to 3 dosing and 6 sampling points.

The user sets up the sampler and doser unit by selecting the dosing/sampling channels and the type of dosing to be used in the task. Dosing can be done either by providing a constant flow of tracer gas to one location or by maintaining a constant concentration of tracer gas at up to three locations. Up to six different dosing setups can be made and stored by the 7651 and the user can switch between different setups during a measurement task. The software controls the Gas Monitor and which gases to be measured at each location (Figure 2).

When setup is complete, the measurement task can be started. The 7651 runs the measurement procedure automatically and measurement results are displayed on the computer's screen and can be stored for further analysis.

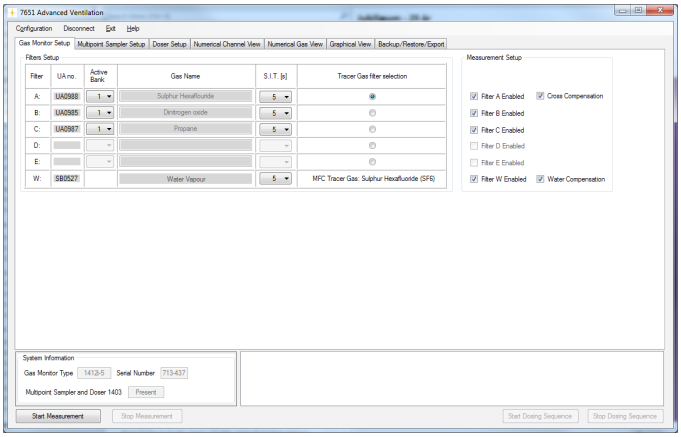

Figure 2a:The Gas Monitor Setup dialog. This dialog enables the user to select the number of gases the monitor will measure, the sampling interval, and define whether the monitor should perform water and cross-compensation.

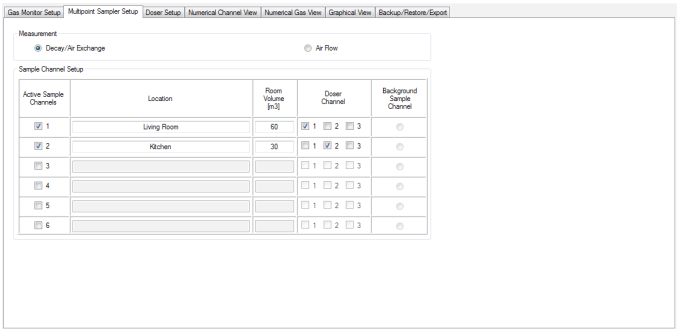

Fig 2b: The Multipoint Sampler and Doser setup, allows you to define which doser channel is linked to a given named Location.

Doser settings

Up to 6 different doser setup's can be predefined and used during the analysis see figure 3.

In the Dosing setup it is possible to predefine up to 6 different dosing setup's the user can then change between these dosing setup's while a measurement is running.

The Algorithm is used to define if constant dose or constant concentration method is to be used during the measurement.

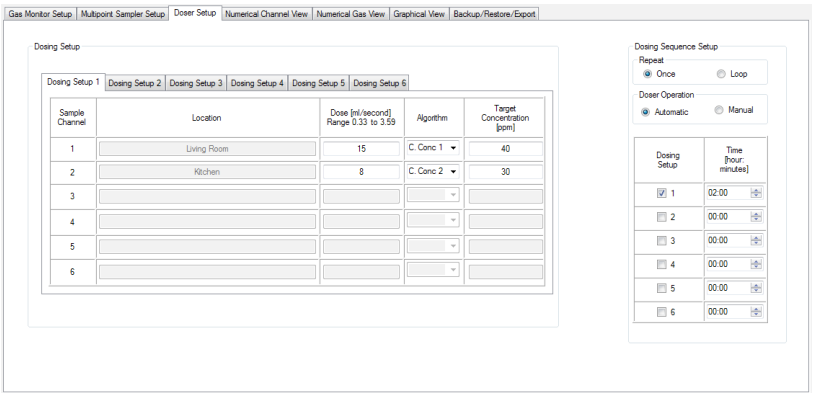

Figure 3: The Doser setup

Software Features

Data Exchange Capability

The Advanced Ventilation Software contains Backup/Restore and Export functionality.

A Backup session can be used to backup the current session to be restored again later .

The Export functionality allows setup and measurement data to be exported to Excel or as a csv file.

Data Display and Output

Measurement data and the running status of the instruments are displayed on-screen. Measurement data can be presented as a graph (Figure 4) or in a numerical table form (Figure 5) in either channel view or gas view; each is updated as new data is received.

When using the graph format, the data displayed as the curves can then be processed, as described in the following section.

Calculation of Results

The user selects the data to be used for further processing by marking the curves with the two vertical cursors. The 7651 is then able to calculate the following values: minimum, maximum, average, and standard deviation of gas concentrations together with the air exchange, age of air, or air flow.

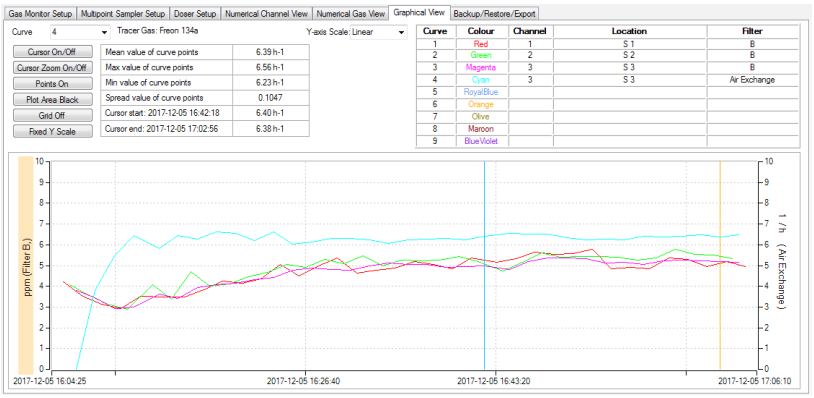

Figure 4. Graph View

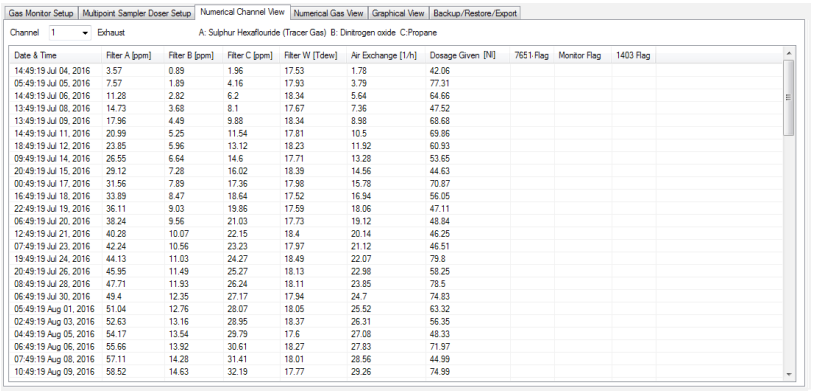

Figure 5a. Numerical Channel View

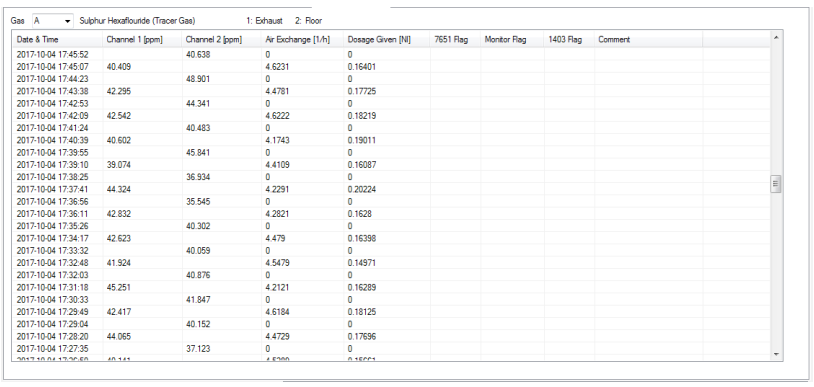

Figure 5b. Numerical Gas View

Technical Specifications

The 7651 software and manual are supplied on a USB Memory Stick and comes with a Security Dongle, which ensures that only authorized users can perform measurements. Data analysis on existing data files can be done without the Security Dongle.

System Requirements

INNOVA 1412i Photoacoustic Gas Monitor.

Or

INNOVA 1512 Photoacoustic Gas Monitor.

And

INNOVA 1403 Multipoint Sampler and Doser

Cables:

Computer to Monitor:
USB Cable AS0001

Gas Monitor to 1403:
USB Cable AS0001

Computer Requirements

The Software is targeted to work on a Microsoft Windows® Operating System:

The computer must meet the following minimum requirements:

Processor: Intel dual-core i3 or compatible.

Operating System: Windows® 7 (Service Pack 1), Windows® 8.1 or Windows® 10.

RAM: Min. 4 GB

Hard Disk: Minimum 500 MB of available space may be required.

Display: HD resolution monitor 1366 X 768 pixel or higher with small fonts.

USB ports: 1 USB port for connection to the Gas Monitor and 1 USB port for the security dongle.

Data Exchange Capability

Data can be exported to Microsoft Excel or as a csv file. Backup and restore of sessions is possible.

Calculation of Values

The 7651 can calculate the values of the following parameters from the curves printed from measurement results:

- Mean value of curve points
- Spread of curve points
- Minimum/maximum values on curve
- Air-exchange
- Local-mean age-of-air
- Air Flow

Ordering Information	Basic System Requirements	Configured System
7651 Advanced ventilation Software for control of Tracer-Gas Monitoring System Includes the following accessories: • Instruction Manual • Security Dongle	Photoacoustic Gas Monitor 1412i Or Photoacoustic Gas Monitor 1512 And Multipoint Sampler and Doser 1403 Computer Teflon Tubing . . . . . .AF0614 Red Nylon Tubing . . . . . AF0005 Green Nylon Tubing . . . . . AF0006 Nylon Tubing . . . . . .AF0007 **Cables:** From initial cap Computer to Monitor: USB cable . . . . . .AS0001 From Monitor to Sampler USB AS0001	**Type 3751-2** Tracer gas system with a dual gas monitor: 1512-2* + 1403 + 7651 **Type 3751-5** Tracer gas system with a multi-gas monitor: 1512-5* + 1403 + 7651 * Optical filters and Calibrations are not included

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