

Highly Accurate, Reliable, and Stable, Sulfur Hexafluoride (SF₆) Leak Detector

SF₆ Leak Detector 3434i



- Easy-to-use, one-button measurement with a 13 second response time for simple, ultra-fast gas detection
- Highly stable, with no consumables or radioactive sources
- Portable and rugged—relocate the detector without loss in accuracy or need for recalibration
- Exceptional accuracy with auto-compensation for temperature and pressure fluctuations, as well as water vapor compensation and measurement
- Expandable to multi-zone monitoring with the 1409 Multipoint Sampler
- Remote control capability via LAN using the LumaSoft Gas Single Point 7810 or Multi Point 7870 software



The SF₆ Leak Detector 3434i from LumaSense Technologies offers unmatched performance and convenience. Based on Photoacoustic Spectroscopy (PAS) technology, the system offers highly accurate, reliable and stable quantitative gas detection. The growing environmental requirements regarding the use of SF₆ make LumaSense's system a coveted tool designed for everyday use.

SF₆-Filled Equipment Testing

In order to meet final test standards, and to uphold any future SF₆ regulations, manufacturers of SF₆-filled equipment must perform quality assurance testing. The 3434i's accuracy and low detection limits enable manufacturers to complete these tests more efficiently and with greater precision.

The system is able to measure the total concentration of SF₆ gas in an enclosed area where the switchgear (or other SF₆-filled equipment) is tested to determine leak rate. By

accurately measuring leak rate, utilities and manufacturers can improve quality while decreasing costs and emissions.

Reliable by Design

The 3434i is capable of measuring accurately over a wide dynamic range. This enables manufacturers and utility end users to not only detect the presence of SF₆, but to measure it quantitatively. The detector can be moved around without any loss in accuracy or need for recalibration. This enables users to locate areas that are a cause for concern.

Simple to Use

Turn it on and press the "Measure" button: that is essentially all you need to do. The detector's extended self-test routines will maintain the reliability of the results, which are available online or can be downloaded as required. The only maintenance task necessary is changing the air filter as recommended for annual calibration.

Application areas:

- Power Utility (Energy T&D)
- Circuit breaker leak testing and maintenance
- Fast, accurate, quantitative leak testing of gas insulated switch gear (GIS) for routine quality control or during field commissioning
- Area monitoring in substations

Selectivity

The gas selectivity of the 3434i is determined by the optical filter 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 analyses cell. Therefore, the monitor is permanently fitted with a special filter that measures water vapor and enables the 3434i to compensate for water vapor interference.

Calibration

The 3434i is equipped with an optical filter to measure SF₆ (UA0988) and delivered calibrated. Thanks to its high stability, calibration of the 3434i is seldom necessary more than once a year.

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

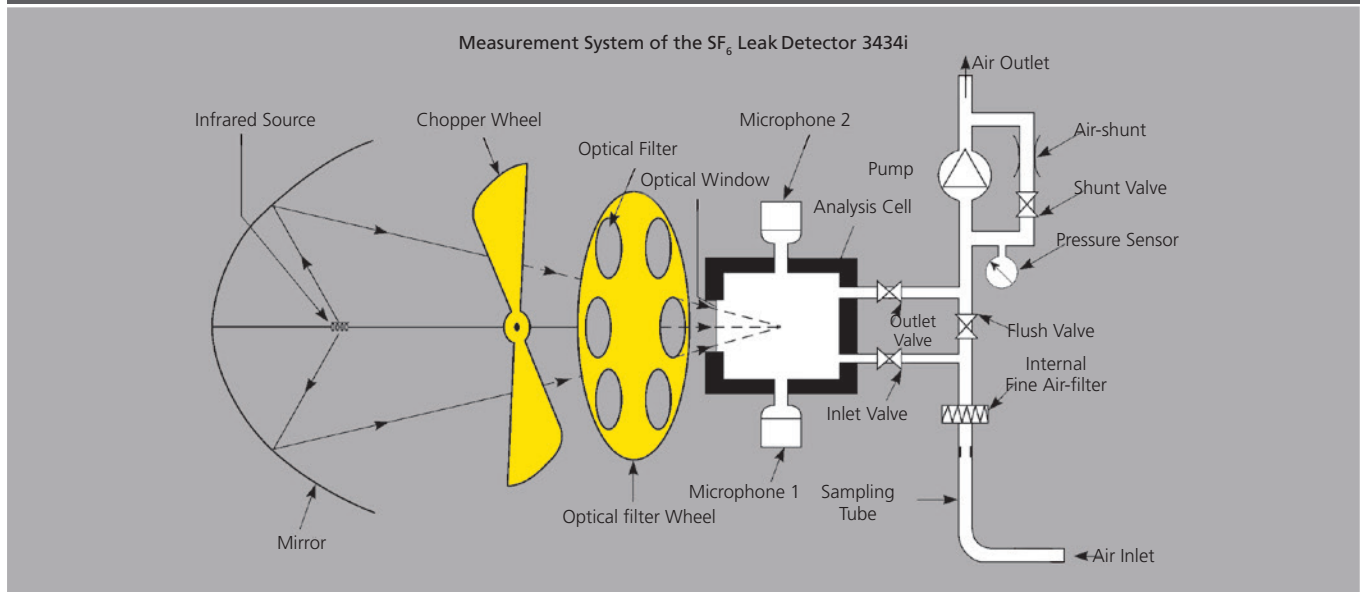
Operation

The 3434i monitoring system is easy to operate using either the application software LumaSoft Gas Single Point 7810 or the optional LumaSoft Gas Multi Point 7870 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.

Setting-up the Monitor

The set-up option enables all the parameters necessary to complete the monitoring task to be defined. Within this option, the Sample Integration Time (S.I.T.) is set, enabling measurement results to be weighted — sensitivity versus speed.

Measurement Cycle



1. The pump draws air from the sampling point through the air filter to flush out the "old" air in the measurement system and replace it with a "new" air sample. The pressure sensor is used to check that the pump sequence has 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 absorbs the light transmitted by the optical filter, causing the temperature of the gas to increase selectively. 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

Starting Measurements

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

Alarms

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

Online Measurement Results

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

In the LumaSoft Gas Single Point 7810 or the optional LumaSoft Gas Multi Point 7870 software, graphs can be configured to display only the desired gases, defined concentration ranges, and results from statistical analyses. Also, all measurement data is stored in a SQL Server 2005 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 3434i's screen (Display Memory) as soon as it is available, and is constantly updated. During a task, the 3434i performs running statistical analyses of the measured gas concentrations, calculating a variety of values for each monitored gas.

The internal database structures the measurement readings on a gas per gas basis, and when applicable, also 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.

Ordering Information

SF₆ Leak Detector 3434i

The 3434i is delivered with the UA0988 optical filter installed. The 3434i also features zero-point, humidity interference, SF₆ and water vapor span calibration.

Included Accessories

AT 2177	4m PTFE tubing
DS0759	Particle Filter (25 pieces)
VF0102A	Fuse
BR6011	Set-up tree
AS0001A	USB Cable
BZ7002	Calibration Software
BZ7003	Offline Software
7810	LumaSoft Gas Single Point monitoring software

Instruction Manual (USB flash drive)

From this memory, data can be uploaded to the Offline Software in either excel or text file format alternatively printed out on a standard printer.

Reliability

The executive self test check ensures that the software, data integrity, and the 3434i's components are functioning properly. If a fault is found, it is reported in the measurement results, so that the integrity of the results can be ensured.

If the power supply fails, the 3434i will automatically restart when power is restored. Measurement data stored in the monitor's memory is not affected by power loss.

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.

Multiple Point Monitoring

The INNOVA 3434i 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 7870 for online monitoring.

In order to monitor several different locations, samples are drawn from up to 24 different points via tubes connected to the inlet of the Multipoint Sampler. The outlet from the multipoint sampler is fed to the 3434i, which is calibrated to a detection limit low enough (6 ppb) to meet the customers' specification.

Remote Control Option

The 3434i offers remote control capability through the user's LAN, USB, or RS232 interfaces using the LumaSoft Gas Single Point 7810 or Multi Point 7870 software.

Optional Accessories

1409	Multipoint Sampler
7870	LumaSoft Gas Multi Point monitoring software
WL 0950-003	RS232 Interface cable 9pin-9pin null-modem
JP 0600	6-pin DIN plug (male) with locking collar for alarm relay
AF 0614	PTFE tubing
UA 1365	Genie Membrane separator (inline)
DS 6015	Membrane replacement kit for UA 1365
UA 0290	Basic recalibration, zero and humidity
UA 0291	Standard recalibration SF ₆

Technical Specifications

Measurement Technique

Photoacoustic infrared spectroscopy.

The UA0988 optical filter is installed to measure SF₆.

Response Time

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

Measurement Specifications¹

Monitor-Setup	Response Times
S.I.T.: "Normal" (5 s) Flushing: Auto, (tube: 1 m)	One gas: ~27 s 1 gas + water: ~40 s
S.I.T.: "Low Noise" (20 s) Flushing: Auto, (tube 1 m)	1 gas + water: ~70 s
S.I.T.: "Fast" (1 s) Flushing: Chamber 4s, Tube "OFF"	One gas: ~13 s 1 gas + water: ~22 s

Detection Limit (for SF₆): 0.006 ppm at 5 S.I.T.

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

Zero Drift: Typically ± Detection limit⁴ per 3 months¹.

Influence of Temperature²: +/- 10 % of detection limit⁴/°C.

Influence of Pressure³: +/-0.5 % of detection limit⁴/mbar.

Repeatability: 1 % of measured value¹

Range Drift: +/- 2.5 % of measured value per 3 months¹.

Influence of Temperature²: +/- 0.3 % of measured value/°C.

Influence of Pressure³: -0.01 % of measured value/mbar.

Reference Conditions:

¹ Measured at 20° C, 1013 mbar, and relative humidity (RH): 60 %. (A concentration of 100x detection limit⁴ was used in determining these specifications.)

² Measured at 1013 mbar and RH: 60 %.

³ Measured at 20 °C and RH: 60 %.

⁴ Detection limit is @5 s S.I.T

Interference:

The 3434i automatically compensates for temperature and pressure fluctuations in its analysis cell and can compensate for water vapor in the air sample.

Acoustic Sensitivity: not influenced by external sound.

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

Internal Data Storage Capacity

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

General

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

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

Power Consumption: ~85 VA.

Air Volume per Sample:

Flushing Settings	Volume of Air
Auto: 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: The total Internal Volume of the measurement system: 60 cm³

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

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

Dimensions:

Height: 175 mm (6.9 in).

Width: 395 mm (15.6 in).

Depth: 300 mm (11.8 in).

Weight: 9 kg (19.8 lbs).

Communication

The monitor has three interfaces, USB, Ethernet, and RS232, for data exchange and remote control of the 3434i. The PC software communicates using the 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-disk.

Software:

7810/7870/BZ7002/BZ7003:

Windows® XP (SP2), Windows® 7, 8, 8.1, and Windows® 10.

WARNING: The 3434i must not be placed in areas with flammable gases/vapors in explosive concentrations or be used to monitor explosive concentrations of these. Also, monitoring of certain aggressive gases or a very high concentration of water vapor may damage the 3434i. Contact your LumaSense representative for further information.

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

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Awakening Your 6th Sense

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