Confidential

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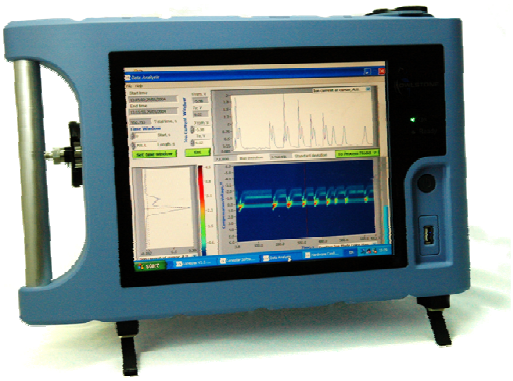
Lonestar FAQ



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What is Lonestar?

Lonestar is a powerful and adaptable chemical monitor in a portable, self contained unit. Incorporating Owlstone's proprietary **F**ield **A**symmetric **I**on **M**obility **S**pectrometer (FAIMS) technology, the instrument offers the flexibility to provide both rapid alerts and detailed sample analysis. It can be trained to respond to a broad range of chemical scenarios and can be easily integrated with other sensors and third party systems to provide a complete monitoring solution. As a result, Lonestar is suitable for a broad variety of application ranging from online/at line process monitoring to lab based R&D.

How will Lonestar save me money?

The decision to use Lonestar will depend on whether cost savings can be achieved through detection. An investment in a Lonestar instrument can result in significant cost saving when applications exhibit the following characteristics

●There is a high throughput of samples or numerous measurements, which directly results in a higher incidence of defective goods

●The likelihood of a defect or bad sample is high

●The cost of shipping a defective product is high e.g. if it is dangerous to the user or if there would be significant brand damage in the event of a recall

You can launch the *cost savings calculator* to determine how much Lonestar can save in your process.

Does Lonestar meet my complete technical requirements?

Your detection problem will have a range of requirements covering, gas of interest, levels of detection, background environment, speed of analysis etc. You can launch the *capability vs requirements* calculator to determine if Lonestar provides you with the total solution you need.

What is FAIMS?

FAIMS stands for Field **A**symmetric **I**on **M**obility **S**pectrometry - a sensitive and proven method of trace detection—a chemical 'fingerprint' is generated for chemicals and is identified and classified using software.

There is a link which describes the detailed technology operation here and a link to a technology whitepaper here.

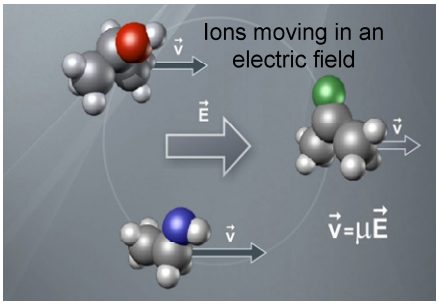
What gases can it detect?

The Owlstone FAIMS device operates as a selective ion filter; how well the sensor detects a particular gas depends on the ionization source used. We currently have UV and Nickel ionisation options.

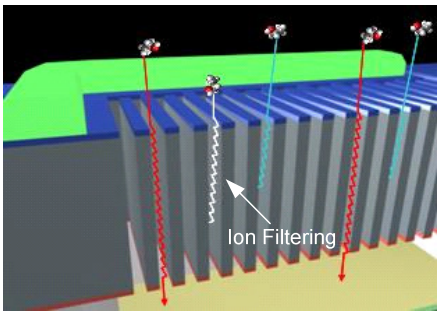
With a Nickel ionization source a gas will be easily ionized and detected if it has a higher proton affinity than other background gases. There is a link for Nickel here.

With a UV ionization source ions will be generated if the gas has an ionisation energy less than 10.6eV. There is a link to gases that can be detected with UV here.

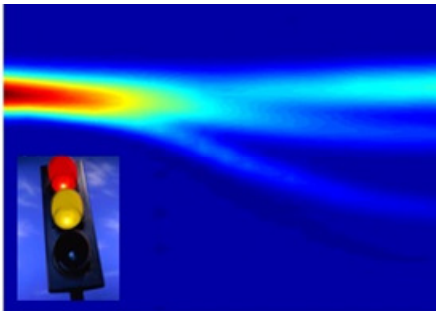
If you have a specific request please contacts us at sales@owlstone.co.uk



What makes a chemical different?
The basic problem of detection is how to detect the chemical of interest in a complex mixture. Owlstone technology identifies chemicals using a property know as 'mobility', a measure of how quickly an ion moves through an electric field. The mobility relates to size and mass, and is used to specifically distinguish and identify the chemical of interest.



Detection with Owlstone FAIMS
The Owlstone sensor acts as a reprogrammable filter, which separates and identifies chemicals according to their characteristic mobility. The sensor 'filters' out the background chemicals that do not have the correct mobility 'fingerprint'. The power and flexibility of the system is due to the fact that the filter can be easily reprogrammed through software and electrical signals to detect almost any chemical.



Identification with a chemical 'fingerprint'
The Owlstone FAIMS technology rapidly creates a fingerprint for all the chemicals present in a mixture, even at extremely low concentrations. Software is used to analyse the fingerprint to provide the user accurate information on the type, and quantity of chemicals present, to allow them to make the right decisions with a high degree of confidence.

What gas fingerprint do you have already?

We have carried out extensive testing for a range of gases related to security and industrial applications. Here some examples – if you have a specific request please contacts us at sales@owlstone.co.uk

CW simulants: DMMP, DEEP, MS etc

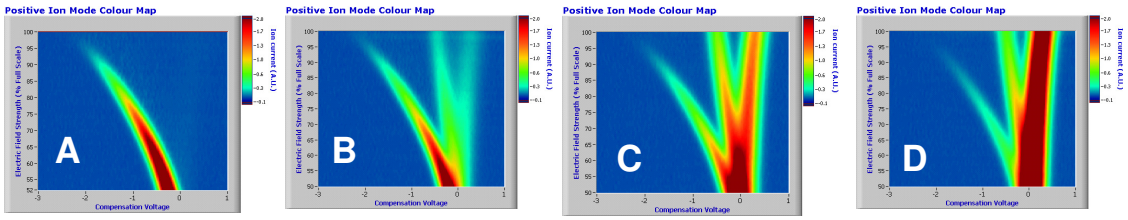
Explosives: TNT, NG, HMTD, EGDN, PETN, RDX (complex mixture tests). DMNB, MNT, DNT.

TICs: Phosgene, Carbon Disulfide, Hydrogen Bromide, Hydrogen Chloride, Hydrogen Cyanide, Hydrogen Fluoride, Arsine, Chlorine, Hydrogen Sulphide, Ammonia.

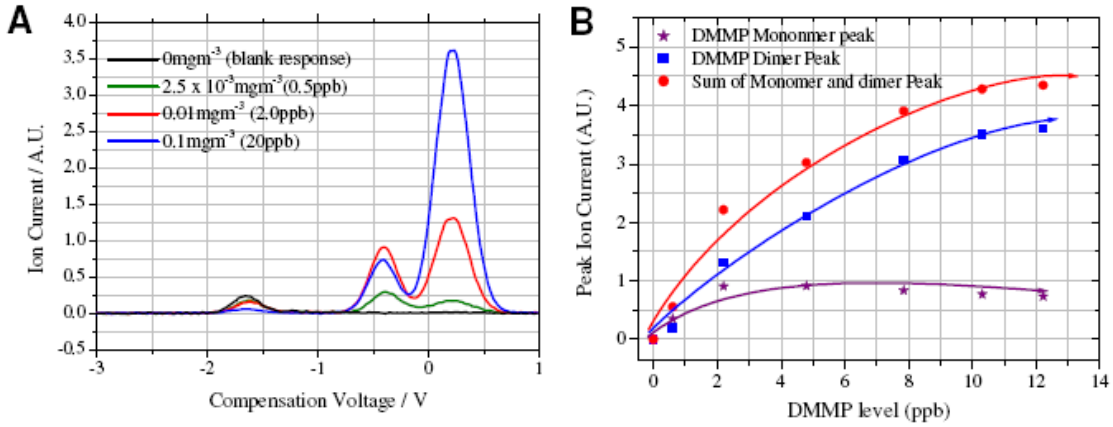
VOCs: Benzene, Xylene, Toulene, Acetone, Formaldehyde.

Can I measure concentration levels?

Yes the intensity of the signal indicates the concentration of gas present. Lonestar can measure very low concentrations quickly and accurately.



Positive ion mode responses for DMMP at **A**: 0mgm^{-3}, **B**: 2.5 x 10^{-3}mgm^{-3} (0.5ppb), **C**: 0.01mgm^{-3} (2.0ppb) and **D**: 0.1mgm^{-3} (20ppb)



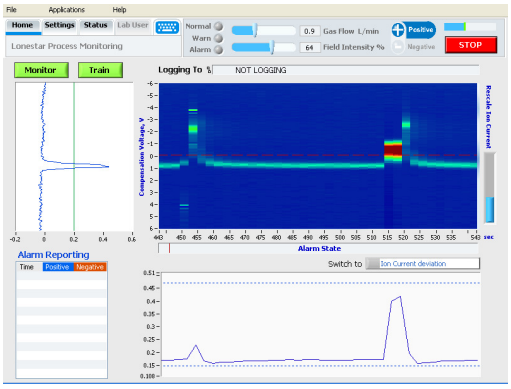
What is the sensitivity / limit of detection?

The Lonestar is a very sensitive instrument and can detect gases down to part per billion levels.

What is the concentration range?

Lonestar has a unique variable sample introduction wheel, which allows the unit to detect from part per billion levels up to percent levels of gases.

What is the recovery time? Are there memory effects? Does the sensor get poisoned or drift over time?



There are no reactive materials or moving parts within the core silicon ion filter so the device is not degraded by over exposure; for the same reason there is no sensor ageing or drift.

The AC drive voltage is continuously measured and adjusted to compensate for any drift in electronic components.

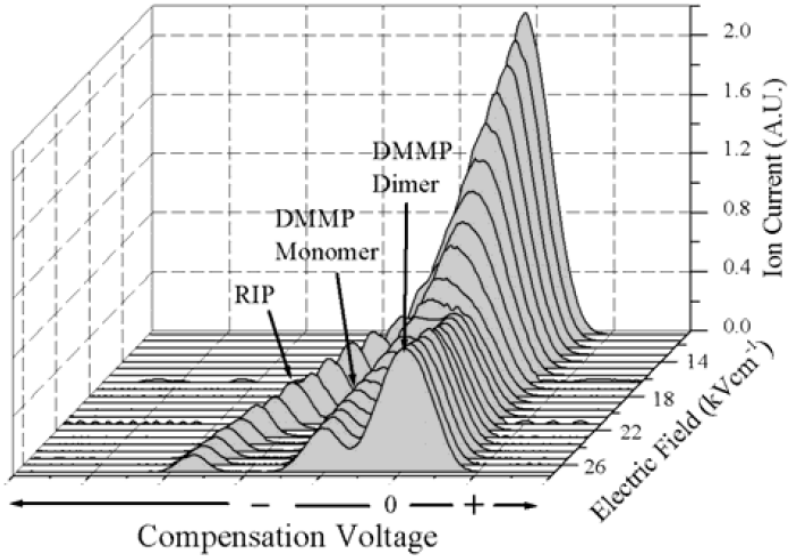
For volatile gases the recovery time is nearly instantaneous. For low volatility compounds we recommend operating the device at increases temperature, which prevents analyte hang up. Please see the spectra below which shows repeated exposures and rapid recovery.

What is instrument warm-up / initialization time?

If you are looking at volatile analytes with low boiling points then the sensor will be operational within a few seconds of switch on as the flow equilibrates. For low volatility compounds we recommend operating the inlet at elevated temperature to avoid analyte 'hang up' in cold spots. Depending on the temperature set point this can take several minutes.

Can I reprogram to alter the selectivity of a particular family of gases dynamically?

Yes. You can control the compensation voltage and amplitude of drive voltages, which allows dynamic control of sensitivity and selectivity. Click *here for a video tutorial.*

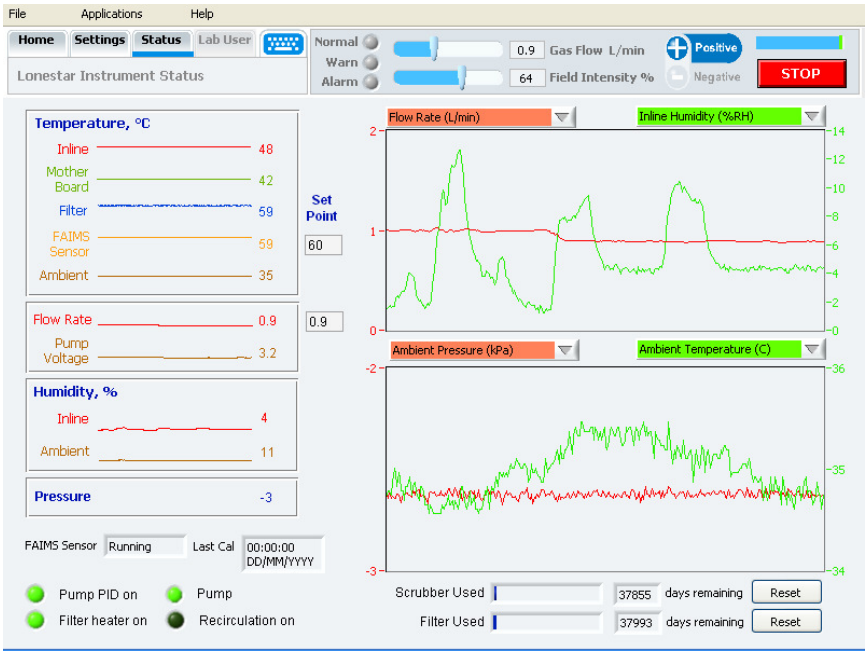


Can I use it in the field?

Yes, Lonestar is very portable and can be carried and used directly in the field.

Is it possible to measure temperature, humidity and air pressure or other sensor data?

We have integrated data from these other sensors in our Lonestar platform. Please see the screen shot below from the Lonestar software. Click *here for a video tutorial*



Is it intrinsically safe?

Lonestar is not certified intrinsically safe but it can be housed in a remote multi-port sampler, which draws sample from remote locations to a central unit.

Are there any consumables?

Owlstone recommends changing the particulate filter and scrubber pack every 5-6months depending on the operating environment. Replacements can be purchased by contacting sales@owlstone.co.uk

How can I calibrate precisely for a particular gas(es)?

The OVG-4 platform is suitable for high precision calibration for a broad range of gases . Please click here is see product and technical information.

Will the device work with high concentrations of background gases?

This once again depends on the ionisation source. The link for Nickel here allows you to change the general and specific composition of the background to determine if the gas of interest is still detectable.