

## Application Note

### Negative gas readings in portable gas detectors



**Although it is physically impossible for the atmosphere to contain a negative quantity of a substance, a gas detector can display a negative reading on either the Lower Explosive Limit (LEL) or toxic channel.**

Negative readings are a result of the detector software interpreting the sensor output. LEL sensors detect gas in a different way to toxic sensors but they both create a signal (electrical output) that is directly proportional to the amount of gas detected.

In the case of the LEL sensor, the output is created when the active bead in the sensor changes its electrical characteristics, when combustible gas is oxidised (burned) on the sensor bead. In the case of toxic sensors, the output is created by a chemical reaction between the gas entering the sensor and the electrolyte in the sensor.

An output is not as simple as “gas in = signal out”; the output represents a change in current flow. This means that even if the sensor is not detecting gas there is still a current flowing through the sensor.

When a device is zeroed or fresh air calibrated you are actually telling the instrument that the “output” of the sensor at the time of calibration is 0% LEL or 0ppm toxic contaminant. Relative to the time of the zero, or fresh air calibration, the output can be either negative or positive. A positive output is more likely to occur because the sensor is reacting to the presence of detectable gas.

#### Zeroing in the presence of contaminants

The easiest way to induce a negative reading is to zero or fresh air calibrate the sensor, when in the presence of measurable contaminants.

It is important to remember that when you zero an instrument, the output of the sensor at that moment becomes the point of comparison. If a toxic sensor is zeroed in air that contains 10ppm of toxic contaminant, and is then taken to an area where the air contains no toxic contaminant, the instrument will display a reading of -10ppm.



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When taken to an area where that toxic contaminant is actually present, readings will be low by this same amount. For instance, if the air contains 15ppm, the instrument would read only 5ppm. The same is also true for combustible gas sensors with readings expressed in %LEL.

#### Stabilising readings prior to zeroing

It's always important to allow sensors a period of time to stabilise after the device is turned on. During this warm-up period the sensor's output may fluctuate - even in fresh air.

The amount of time required for stabilisation varies from sensor to sensor. Some start with negative readings and count up as they stabilise, whilst others start with positive readings and count down.

Most sensors will fully stabilise in less than three minutes. If the instrument is zeroed before stabilisation is complete, further change in the output as the sensors continue to stabilise may produce either positive or negative "drift". It is recommended to wait until your instrument's readings have stopped changing before you zero the device.



#### Cross-interference and negative readings

Gas-specific electrochemical sensors are designed to minimise the effects of cross-interference from other gases, responding only to the gas they are supposed to measure. Even though care has been taken to reduce cross-sensitivity, some interfering gases may still have an effect on toxic sensor readings. In some cases the interfering effect may be "positive" and result in readings that are higher than they actually are. In a few cases the interference may be negative and produce readings that are lower than they really are.

#### Dealing with negative gas readings

Take the device into a fresh air environment and wait for the readings to stabilise. If the readings are still negative, re-zero the instrument.

If a gas detector has drifted more than  $\pm 50\%$  of the default alarm value it will be necessary to do a "forced" zero calibration. Please refer to the user manual for your gas detector to carry out the appropriate procedure.

#### Bump testing and device calibration

There are two key elements to remember when calibrating; aside from zeroing the device it is also necessary to expose the sensor to a known concentration test gas to check that the sensor responds to the presence of gas and alarms.

Remember that calibration is a two-step procedure. Simply zeroing the instrument is not enough - it's also necessary to verify sensor response while the sensor is actually exposed to a known concentration of test gas.

Officially approved BW Technologies by Honeywell distributors may offer third-party devices maintenance services such as calibration, which can help to maximise device uptime. Please contact your distributor for more information on maintaining portable gas detectors.

#### Portable gas detection

##### Impact range



High specification, 4-gas simultaneous monitoring solution designed to meet the needs of the most challenging applications. Model variants include Impact Pro, which features an integrated automatic pump, Impact IR and Impact (standard).

##### Impulse XT



Impulse XT is a single-gas portable detection solution with zero maintenance requirements. Delivering 24/7 monitoring with a two year operational life, this device also features an IP67 rating making it ideal for challenging environments.

##### GasAlertClip Extreme



Compact and affordable, GasAlertClip Extreme offers 24/7 monitoring of single gas hazards with zero maintenance requirements. With easy on/off operation, this single gas detector is available in two and three year model variants.

##### GasAlert Extreme



Compact and affordable, GasAlert Extreme reliably monitors for any single toxic gas hazard. With easy on/off operation, this single gas detector offers extended longevity with a two year field-replaceable battery and sensor.

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### GasAlertQuattro



Rugged and reliable, the GasAlertQuattro 4-gas detector combines a comprehensive range of features with simple one-button operation. The graphic LCD displays easy to identify icons that indicate operational information, such as bump test and calibration status for simplified onsite auditing.

### GasAlertMicroClip XT



The slim and compact GasAlertMicroClip XT provides affordable protection from atmospheric hazards. With simple one-button operation, this device offers ultimate ease of use and significantly reduces time spent training the user.

### GasAlertMax XT II



The rugged GasAlertMax XT II monitors for up to four gas hazards and combines straightforward one-button field operation with an integrated sampling pump. Tamper-proof, user-adjustable options enable the instrument to be customised to suit application needs.

### GasAlertMicro 5 Series



Compact and lightweight, GasAlertMicro 5 Series instruments are available in diffusion or pumped formats. These portable gas detectors simultaneously monitor and display up to five atmospheric hazards. Model variants include the GasAlertMicro 5 PID model for the low level detection of VOCs and GasAlertMicro 5 IR for CO<sub>2</sub> monitoring.

### ToxiPro®



A compact and rugged single-gas toxic portable detector with one-button simplicity, continuous real-time display and highly visible/audible alarms for high noise locations. ToxiPro® features an integrated blackbox data recorder and event logger as standard (compatible with IQ Express Single Gas Docking Station).

### MultiPro™



4-gas device with real-time simultaneous readings, simple one-button operation and a large easy-to-read LCD display. MultiPro™ features an integrated blackbox data recorder and event logger as standard. An optional screw-on pump with automatic leak test and low flow alarm is also available. (Compatible with IQ Express Multi-Gas Docking Station).

### PHD6™



Simultaneous monitoring of up to six gas hazards with 18 sensor choices, including PID for the low-level detection of CO<sub>2</sub> and CH<sub>4</sub>. PHD6 features an integrated blackbox data recorder and event logger that records all atmospheric hazards experienced during operation. (Compatible with IQ6 Multi-Gas Docking Station).

### Automatic device testing solutions

#### MicroDock II



The MicroDock II is an easy, cost-effective way to bump-test, calibrate and charge a device as well as manage records. Fully compatible with the complete BW Technologies by Honeywell product range, its accompanying

Fleet Manager II software allows the user to download information faster than ever from the MicroDock II. Improved functionality allows the creation of accurate and user-friendly reports, print receipts of calibration, sort and graph data and archive information, helping to dramatically simplify fleet management activities.

#### Enforcer



Designed for use with the Impact range of portable gas detectors, Enforcer is a small, lightweight test and calibration station that is fully portable. With no batteries or mains power required, Enforcer permits quick testing on the move and helps to reduce the ongoing cost of portable device maintenance.

#### ToxiPro IQ Express Docking Station



A fully automated bump test, calibration and datalogging station for use with the ToxiPro® portable range, allowing four devices to be linked to a single gas supply. Connects to a PC via USB port or Ethernet (optional).

#### Multi-Pro IQ Express Docking Station



A fully automated bump test, calibration and datalogging station for use with the MultiPro range of portable gas detectors. Connects to a PC via USB port or Ethernet (optional).

#### IQ6 Docking Station



A fully automated bump test, calibration and datalogging station for use with the PHD6™ range of portable gas detectors. Connects to a PC via USB port or Ethernet (optional).



# Honeywell Gas Detection



Honeywell is able to provide gas detection solutions to meet the requirements of all applications and industries. Contact Honeywell Analytics or BW Technologies by Honeywell in the following ways.

## Fixed Gas Detection

### Honeywell Analytics Experts in Gas Detection

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## Portable Gas Detection



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