Tech Trends & Enhancements for Portable Gas Monitors

Mark Boggess
mboggess@argus-hazco.com  800-332-0435
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- Consulting, Training and Compliance Assistance
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- Financing, Rental and Leasing
- Product Sales, Training, Documentation & Technical Support
Gas/Vapor Monitors for Confined Space Entry


- Calibrated for Hazardous Atmosphere of Potential Concern \((VOC's, SO_2, NH_3, CL_2, etc.)\)
- Direct Reading Devices Required \((Display -vs- Alarm Only)\)
- Pre-Entry Clearance Testing Required
- Records of Air Contaminant Concentrations
- Periodic or Continuous Monitoring Allowed

Construction Standard requires Continuous Monitoring
## Most Common Gas & Vapor Sensor Configuration

<table>
<thead>
<tr>
<th>Target Gas</th>
<th>Combustibles (CH4), Methane Cal standard</th>
<th>Oxygen (O2)</th>
<th>Hydrogen Sulfide (H₂S)</th>
<th>Carbon Monoxide (CO)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td><strong>0-100% LEL</strong></td>
<td><strong>0-40.0 vol%</strong></td>
<td><strong>0-100.0 ppm</strong></td>
<td><strong>0-500 ppm</strong></td>
</tr>
<tr>
<td><strong>(Increment)</strong></td>
<td><strong>(1% LEL)</strong></td>
<td><strong>(0.1 vol%)</strong></td>
<td><strong>(0.5 ppm)</strong></td>
<td><strong>(1 ppm)</strong></td>
</tr>
<tr>
<td><strong>Detection Method</strong></td>
<td><strong>Diffusion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Response Time</strong></td>
<td><strong>T90 Within 30 Seconds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Display</strong></td>
<td><strong>Digital LCD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gas Alarms</strong></td>
<td><strong>Alarm 1: 10% LEL</strong> (Decreasing)</td>
<td><strong>Alarm 1: 19.5 vol%</strong></td>
<td><strong>Alarm 1: 10.0 ppm</strong></td>
<td><strong>Alarm 1: 25 ppm</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Alarm 2: 50% LEL</strong></td>
<td><strong>Alarm 2: 23.5 vol%</strong></td>
<td>**Alarm 2: ** <strong>20.0 ppm</strong></td>
<td><strong>Alarm 2: 190 ppm</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Over: 100% LEL</strong></td>
<td><strong>Over: 40.0 vol%</strong></td>
<td><strong>Over: 100.0 ppm</strong></td>
<td><strong>Over: 300 ppm</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>TWA: 10.0 ppm</strong></td>
<td><strong>TWA: 25 ppm</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>STEL: 15.0 ppm</strong></td>
<td><strong>STEL: 190 ppm</strong></td>
</tr>
</tbody>
</table>
Hazardous Atmospheres

Gases, Dusts, Mists or Vapors Present in Concentrations Which Exceed the Permissible Exposure Limit (PEL)

Common Toxic Gas Sensors

CO, CO\(_2\), H\(_2\)S, SO\(_2\), NO, NO\(_2\), ETO, Cl\(_2\), ClO\(_2\), NH\(_3\), PH\(_3\), HF, Br\(_2\)
Combustion Requires...

Heat

Fuel

Oxygen
PID Correction Factors

- Most manufacturers furnish tables, or built-in library of correction factors to correct or normalize readings when contaminant known.

- Advanced designs allow users to store calibration curves for several different calibration gases, then pick from the built-in library of correction factors to provide readings for the contaminant being measured.

- Thus, user might pick 100 ppm isobutylene from the list of calibration curves stored in the instrument’s memory, then choose acetone as the contaminant being measured.

- In this case the instrument is able to express readings in true parts per million acetone equivalent concentrations.
When an instrument's reference point shifts, the reading will shift accordingly and be unreliable. This is called "calibration drift," and it happens to all sensors over time.

Calibration checks or full calibration with a traceable gas concentration will verify or update the instrument's reference point.

Operators should conduct these procedures daily, or more frequently if needed, to ensure that the instrument will continue to produce accurate readings.
International Safety Equipment Association - Definitions

A. **Bump Test** (Function Check) - A qualitative function check where a challenge gas is passed over the sensor(s) at a concentration and exposure time sufficient to activate all alarm indicators to present at least their lower alarm setting. The purpose of this check is to confirm that gas can get to the sensor(s) and that all the alarms present are functional.

B. **Calibration Check** - A quantitative test utilizing a known traceable concentration of test gas to demonstrate that the sensor(s) and alarms respond to the gas within manufacturer’s acceptable limits. This is typically ±10-20% of the test gas concentration.

C. **Full Calibration** – The adjustment of the sensor(s) response to match the desired value compared to a known traceable concentration of test gas.
A bump test (function check) or calibration check of portable gas monitors should be conducted before each day’s use in accordance with the manufacturer’s instructions. Any portable gas monitor which fails a bump test (function check) or calibration check must be adjusted by means of a full calibration procedure before further use, or removed from service.

A full calibration should be conducted at regular intervals in accordance with instructions specified by the instrument’s manufacturer, internal company policy, or a regulatory agency.
Instrument: RKI GX6000 Five Gas Monitor  
O₂/LEL/CO/H₂S/HCN Monitor / Serial No.: 

Calibration Gas(s) Required: 2.5% Methane (50% LEL), 12% Oxygen, 50 PPM Carbon Monoxide, 25 ppm Hydrogen Sulfide in Nitrogen and 10 ppm Hydrogen Cyanide. When bump checking instrument check to: 40-60% LEL, 11.5-12.5% O₂, 40-60 PPM CO, 20-30 ppm H₂S, 8-12 ppm Hydrogen Cyanide (±20%).

<table>
<thead>
<tr>
<th>Calibration Gas (Lot#/Expiration Date)</th>
<th>1&lt;sup&gt;st&lt;/sup&gt;: Lot#</th>
<th>/</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt;: Lot#</th>
<th>/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Name</td>
<td>Confirm Fresh Air Zero</td>
<td>Reading Before Adjustment</td>
<td>Reading After Adjustment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>%LEL</td>
<td>%O₂</td>
</tr>
</tbody>
</table>

Record Date, Name of Tester, Response Before and After Calibration Adjustment, Cylinder Lot # (Verify Expiration Date), Confirm Cleanliness of Monitor and Indicate Speed of Response.

Records must be kept for (Manual) Calibrations.
Automated Calibration Systems
Influence of Gas & Vapor Density

Measure of a Vapor’s Weight Compared to Air

Lighter Than Air

Hydrogen, Methane, Ammonia

Heavier Than Air

Propane, Hydrogen sulfide, Gasoline

Heavier Than Air
Wireless Man Down Systems

For Fixed Locations – ID, Location, Status, EVAC
Mobile Lone Worker Systems

Has an onboard GPS Receiver with 1 mile Line of Site operational range
Man Down Integration
into Portable Gas Monitors

Several manufacturers are beginning to integrate **Passive Alert Safety Systems** (PASS), like those used in the Fire Service, into their portable gas monitors.

This feature, when enabled, allows an alarm to be produced when a user becomes motionless.

Some manufacturers are incorporating manual “Panic” alarms.
Man Down Integration

- **MSA** – Altair 4X and 5X
- **RKI** – GX6000 Series
- **Honeywell/RAE Systems**
  - MultiRAE & MicroRAE

- May also allow wireless integration including email or SMS messaging.

Like a PASS device; first warnings and second warnings can be reset by moving the device and will alarm after 20 and then 24 seconds of no detected movement. Final alarm sounds after 30 seconds of no detected movement and can be reset only by pressing the DOWN button.
What's new in Wireless Personal Monitors?

- Man Down Alarm and GPS capability
- Bluetooth® Low Energy / Mesh / Wi-Fi Wireless technologies
- For customers that interested in going beyond compliance
Wireless Systems Interface

- Allows current conditions from instruments in use to be wirelessly transmitted to operate alarm devices or to be monitored from a remote location.
- Blue Tooth & Wireless Communication protocols
- Limited to 30’ for Bluetooth, 660’ for MESH & 2-3 Mile (Line of Sight) for 900 Mhz Long Range.
- Require repeaters in some environments.
- Capable of Internet transmission & messaging.
Draeger X-Zone 5500

Accessory for X-am 5000 Series Portable Monitors
Draeger X-Zone 5500
RAE Systems ProRAE Guardian

Venue Protection for nearly 15 Years
RAE Systems ProRAE Guardian

National Guard Civil Support Teams (CST) & Regional Hazmat
Honeywell ConneXt Lone Worker

RAE Systems’ Closed-Loop Wireless Solutions for Portable Gas Monitors Enable Real-Time Remote Threat Visibility for Faster Incident Response
Honeywell’s unique solution reliably keeps safety managers and lone workers connected close to 100 percent of the time via cellular or satellite networks. Safety managers have near real-time with...
Trakopolis Software

Easy to Use Interface and Maps
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