

WILDWOOD CREST FIRE DEPARTMENT

MSA Orion MultiGas Monitor

Basic Operation



March 27, 2007

WILDWOOD CREST FIRE DEPARTMENT

Basic Operation of the

MSA Orion MultiGas Monitor

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WILDWOOD CREST FIRE DEPARTMENT
MSA Orion MultiGas Monitor

Basic Operation

All functions are attained using a very basic 2-Button Operation:

Big, Left, 'Page' Button and Small, Right, 'Change/Reset' Button

Measure Page (Home Page) - measures O₂, CO, LEL and H₂S, using electro-chemical sensors.

1. Press Page (Left) Button to activate the unit.
2. While in a fresh air setting, wait for the flashing "ZERO" in the upper left corner of the screen, and press the Page (Left) Button again.
3. Wait for 3 beeps – Unit is now ready to use.
4. Block intake on sensor to assure pump operation; reset by pressing Change/Reset (Right) Button.

Leak Page (2nd Page) – allows users to search for small leaks.

1. To switch to the Leak Page, press Page (Left) Button once.
2. When the word "Off" appears in the lower right corner of the screen, press the Change/Reset Button.
3. As the 'tornado' bar counts down, the sensor is warming up. When the bar gets to the bottom, the unit begins 'ticking' and the leak mode is operational.
Note: When the Leak Mode ticker is ON, the combustible (LEL) sensor in the unit is shut down. The other toxic and oxygen sensors are operating and will alarm if needed.
4. You can change the baseline of the ticker by pressing the 'Change/Reset' (Right) button once.

To return to the Measure Page:

1. Press the PAGE BUTTON and hold for 4-5 seconds.
2. The word "Off" will appear in the lower right corner of the screen. Wait 8-10 seconds and the unit will return to the normal mode.

Other Pages

From the Measure Page, press the left button to advance to other pages.

As stated above, press the Page Button once to go to the Leak Mode page, where you can turn the leak detector on or off. Press the Page Button again to go to the:

Bar Hole Page (3rd Page) – for timed Bar Hole readings. The combustible sensor reading appears in the upper left corner, and the timer, pre-set at 15 seconds, appears in the lower right corner

1. To take a timed bar hole reading, press the Change/Reset button once. At the end of the timed reading, the peak reading will be displayed.
2. To take a 2nd bar hole reading, press the Change/Reset button again one time.
When finished, press the Page Button to go to the next page...

Peak Page (4th Page) – shows the highest reading seen by any of the sensors since the instrument was turned on.

Press the Page Button again to go to the next page...

Min Page (5th Page) – shows the lowest reading the Oxygen sensor has seen since the instrument was turned on.

Press the Page (Left) Button again to return to the Measure Page (Home Page)

Shut Down

To shut the instrument down, must be at the Measure Page;

1. Press the Page (Left) Button and hold for approx. 5 seconds, until the small icon goes away.

Online Information: <http://www.msanorthamerica.com/catalog/product1388.html>

Click Literature tab

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4 SENSORS

Combustible Sensor – measures % of Lower Explosive Limit

Oxygen Sensor – measures % of Oxygen in Air

Carbon Monoxide Sensor – measures CO in Parts Per Million

Hydrogen Sulfide Sensor – measures H₂S in Parts Per Million

% LEL 0	% O₂ 20.8
PPM CO 0	PPM H₂S 0

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Combustible Gas Sensor

WHAT IS THE EXPLOSIVE RANGE OF A GAS?

The **explosive limit** of a gas or a vapor, is the limiting concentration in air that is needed for the gas to ignite and explode. There are two explosive limits for any gas or vapor, the **lower explosive limit (LEL)** and the **upper explosive limit (UEL)**.

At concentrations in air below the LEL, there is not enough fuel to continue an explosion; at concentrations above the UEL the fuel has displaced so much air that there is not enough oxygen to begin a reaction.

The table on the right shows the explosive range of several gases and vapors. Concentrations are given in percent by volume of air.

Because our Orion meter measures the combustibility of a wide range of gases, it does not measure the % of gas by volume. It measures the **percentage of the lower explosive limit (LEL)** that it is sensing.

For example, in a concentration of 3% methane in air, the Orion would indicate **60% of the LEL**, which, as the table indicates, is 5% for methane.

The meter will “alarm” at 10% of LEL, which, though not yet ‘explosive’, is a serious concentration. 100% of LEL is explosive.

Remember that a leak can cause the % of gas concentration to rise rapidly, depending on the space being filled and the severity of the leak.

Also, since the highest reading that our meter senses is 100% of LEL, an initial reading found of 100% could be anything from borderline LEL to well above LEL, even above the UEL.

Substance	LEL	UEL
Acetone	3%	13%
Acetylene	2.5%	82%
Benzene	1.2%	7.8%
Butane	1.8%	8.4%
Ethanol	3%	19%
Ethylbenzene	1.0%	7.1%
Ethylene	2.7%	36%
Diethyl ether	1.9%	36%
Diesel fuel	0.6%	7.5%
Gasoline	1.4%	7.6%
Hexane	1.1%	7.5%
Heptane	1.05%	6.7%
Hydrogen	4.1%	74.8%
Hydrogen sulfide	4.3%	46%
Kerosene	0.6%	4.9%
Methane	5.0%	15%
Octane	1%	7%
Pentane	1.5%	7.8%
Propane	2.1%	9.5%
Propylene	2.0%	11.1%
Styrene	1.1%	6.1%
Toluene	1.2%	7.1%
Xylene	1.0%	7.0%

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Combustible Gas Sensor

% LEL 0	% O2 20.8
PPM CO 0	PPM H2S 0

Measures in % OF LOWER EXPLOSIVE LIMIT (LEL)

0% LEL is normal.

Alarms at 10% of LEL

BE AWARE OF THE DIFFERENCE:

% of LEL vs. % combustible gas by volume

The Orion measures combustible gas by % of LEL . Some monitors measure % of combustible gas by volume, and some measure **both**.

We monitor % of LEL, because we may come in contact with many different gases with varying explosive limits. Our monitor will alarm at 10% of the LEL of methane. LEL of methane is 5% by volume. (It will also alarm at 10% of the LEL of pentane, which is 1.5% by volume.)

IMPORTANT - The gas company monitors by % of combustible gas by volume.
(They are monitoring natural gas only.)

Natural Gas has an explosive range of 5-15% by volume.

If we get a combustible gas reading of 6% of LEL, it's 6% of the Lower Explosive Limit and it not a hazardous reading;

if the gas company gets a reading of 6% of combustible gas by volume, it's above the 5% LEL and it's a very hazardous reading.

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Oxygen Sensor

% LEL 0	% O2 20.8
PPM CO 0	PPM H2S 0

Measures in % of Oxygen in the Air.

20.8% is normal.

In areas with decreased levels of oxygen - Alarms at **19.5%**

In areas with increased levels of oxygen – Alarms at **23.5%**

% Oxygen	Physiological Effect
19.5% – 16%	No visible effect.
16% – 12%	Increased breathing rate. Accelerated heartbeat. Impaired vision, thinking and coordination.
14% – 10%	Faulty judgment and poor muscular coordination. Muscular exertion causing rapid fatigue. Intermittent respiration.
10% - 6%	Nausea, vomiting. Inability to perform vigorous movement, or loss of the ability to move. Unconsciousness followed by death.
Below 6%	Difficulty breathing. Convulsive movements. Death in minutes.
Above 23.5%	The atmosphere is considered oxygen enriched, and is prone to become unstable. The likelihood and severity of a flash fire or explosion is significantly increased.

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Carbon Monoxide Sensor

% LEL 0	% O2 20.8
PPM CO 0	PPM H2S 0

Measures in **PARTS PER MILLION** (ppm)

0 ppm is normal.

Alarms at **30 ppm**

PPM Level CO	Physiological Effect
200 ppm for 3 hours, or 600 ppm for 1 hour	Headache and discomfort.
500 ppm for 1 hour or 1000 ppm for for 30 minutes	Pounding of heart, dull headache, dizziness, flashes before eyes, ringing in ears, nausea.
1500 ppm for one hour	Dangerous to life.
4000 ppm	Rapid collapse, unconsciousness and death within minutes.

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Hydrogen Sulfide Sensor

% LEL 0	% O2 20.8
PPM CO 0	PPM H2S 0

Measures in **PARTS PER MILLION** (ppm)

0 ppm is normal.

Alarms at **10 ppm**

PPM Level H2S	Physiological Effect
18 - 25 ppm	Eye irritation.
75 – 150 ppm for several hours	Respiratory irritation.
170 – 300 ppm for 1 hour	Marked irritation.
400 – 600 ppm for ½ - 1 hour	Unconsciousness, death.
1000 ppm	Fatal in minutes

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RECAP of Pages 5-8

Oxygen Sensor - Measures in % of Oxygen in the Air.

20.8% is normal. Alarms at 19.5% & 23.5%

% Oxygen	Physiological Effect
19.5% – 16%	No visible effect.
16% – 12%	Increased breathing rate. Accelerated heartbeat. Impaired vision, thinking and coordination.
14% – 10%	Faulty judgment and poor muscular coordination. Muscular exertion causing rapid fatigue. Intermittent respiration.
10% - 6%	Nausea, vomiting. Inability to perform vigorous movement, or loss of the ability to move. Unconsciousness followed by death.
Below 6%	Difficulty breathing. Convulsive movements. Death in minutes.
Above 23.5%	The atmosphere is considered oxygen enriched, and is prone to become unstable. The likelihood and severity of a flash fire or explosion is significantly increased.

Carbon Monoxide Sensor – Measures in PARTS PER MILLION (ppm)

0 ppm is normal. Alarms at 30 ppm

PPM Level CO	Physiological Effect
200 ppm for 3 hours, or 600 ppm for 1 hour	Headache and discomfort.
500 ppm for 1 hour or 1000 ppm for for 30 minutes	Pounding of heart, dull headache, dizziness, flashes before eyes, ringing in ears, nausea.
1500 ppm for one hour	Dangerous to life.
4000 ppm	Rapid collapse, unconsciousness and death within minutes.

Hydrogen Sulfide Sensor – Measures in PARTS PER MILLION (ppm)

0 ppm is normal. Alarms at 10 ppm

PPM Level H2S	Physiological Effect
18 - 25 ppm	Eye irritation.
75 – 150 ppm for several hours	Respiratory irritation.
170 – 300 ppm for 1 hour	Marked irritation.
400 – 600 ppm for ½ - 1 hour	Unconsciousness, death.
1000 ppm	Fatal in minutes

Combustible Gas Sensor – Measures in % of LOWER EXPLOSIVE LIMIT (LEL).

0% is normal. Alarms at 10% of LEL

BE AWARE OF THE DIFFERENCE: % of LEL vs. % combustible gas by volume

The Orion measures combustible gas by % of LEL

Some monitors measure % of combustible gas by volume, and some measure both.

We monitor % of LEL, because we may come in contact with many different gases with varying explosive limits. Our monitor will alarm at 10% of the LEL of methane. LEL of methane is 5% by volume. (It will also alarm at 10% of the LEL of pentane, which is 1.5% by volume.)

IMPORTANT - The gas company monitors by % of combustible gas by volume.

(They are monitoring natural gas only.)

Example – Natural Gas has an explosive range of 5-15% by volume.

If we get a combustible gas reading of 6% of LEL, it's 6% of the Lower Explosive Limit (5% by volume) and it not a hazardous reading; if the gas company gets a reading of 6% of combustible gas by volume, it's above the 5% LEL and it's a very hazardous reading.

Other things to remember: *What part of the room are some hazards found?*

1. **Methane** is lighter than air.
2. **Carbon Monoxide** has the same molecular weight as air.
3. **Hydrogen Sulfide** is heavier than air.