

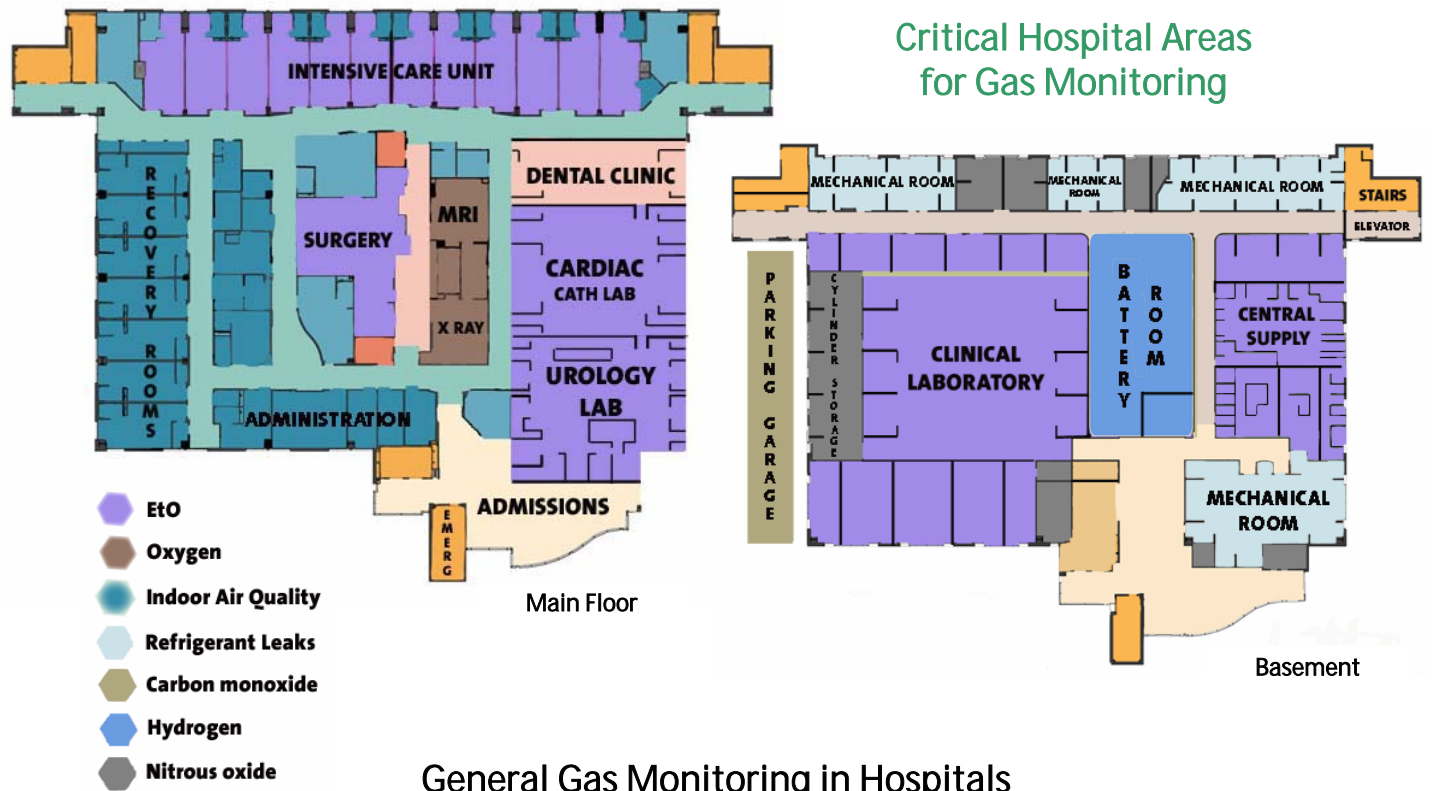
# Gas Monitoring in the Medical Industry



## MSA Gas Detection Solutions [for Monitoring Gases in Hospitals]



Hospital designs vary greatly, however all hospitals have areas where gas detection should be used. Below is a hypothetical hospital layout showing areas where gas monitors may be placed.



### General Gas Monitoring in Hospitals

Location	Type of Monitoring	Hazard	MSA Gas Monitoring Solutions	Applicable Regulations/ Exposure levels
Central Supply, laboratories, surgery areas, Intensive Care Unit, cardiac catheterization lab, dental clinic, urology department	PPM ethylene oxide	Worker exposure to EtO used in sterilization process	EtoX® II Gas Monitor Chemgard® Gas Monitor Toxgard® II Area Monitor Ultima® X Gas Monitor	29 CFR 1910.1047 TLV = 1 ppm*
MRI room	Oxygen deficiency	Release of liquid helium or nitrogen used to cool magnet creates an oxygen-deficiency hazard	Toxgard II Area Monitor Ultima X Gas Monitor	OSHA 29 CFR 1910.141
ALL hospital rooms	Indoor air quality	Buildup of CO <sub>2</sub> and VOC levels Sick building syndrome	AirOX® Indoor Air Quality Monitor	ASHRAE 62R
Mechanical room	Refrigerant leak detection	Refrigerant leaks from chillers	Chillgard® Monitor Product Line	ASHRAE 15-2001
Air Intakes & Parking Garages	Carbon monoxide	Vehicle exhaust contaminating Intake system	Toxgard II Area Monitor Ultima X Gas Monitor TGM® Series of Gas Monitors	TLV = 25 ppm*
Cylinder storage delivery to operating room	Leak monitoring-ppm nitrous oxide	Cylinder, valve or line leaks can create high levels of nitrous oxide	Chemgard Gas Monitor	TLV = 50 Ppm*
Battery rooms	LEL hydrogen	Buildup of hydrogen to explosive levels	Ultima X Gas monitor	LEL = 4%

\*TLVs taken from 2003 ACGIH

Table above shows many of the typical gas monitoring applications in hospitals as well as the MSA Gas Monitor best suited for this application. Other hospital gas monitoring applications are possible. Contact your MSA sales representative for further information on gas monitoring needs in hospitals.



# Focus on Ethylene Oxide Monitoring

Due to its effectiveness at eliminating bacterial and viral microbes, ethylene oxide (EtO) is the most widely used low-temperature gas sterilant in the medical industry. Unfortunately it is highly toxic, and even a brief inhalation can be fatal. EtO also has an extremely wide explosive range of 3% to 100% volume in air, and in the presence of a spark, can spell disaster.

EtO is colorless, and odorless in concentrations of less than 700 parts per million (ppm), so workers cannot rely on their senses to determine when it is present. Without reliable detection instrumentation, personnel can unknowingly—and rapidly—become exposed to dangerous levels. Studies estimate that approximately 270,000 U.S. workers are exposed to EtO every year, with most exposures resulting from sterilization applications.

## Health Effects of EtO

Low-level EtO exposure effects include eye, skin, and mucous membrane irritation that can lead to pulmonary edema. EtO is a central nervous system depressant and irritant and can affect brain and nerve functioning, resulting in peripheral paralysis. At higher levels, such as those resulting from accidents or equipment failure, the effects are similar in type, yet more severe, and can be fatal. There is also evidence that EtO exposure can cause reproductive damage, including an increased chance of miscarriage. Studies of EtO exposure in sterilization rooms have shown an increased incidence of leukemia, stomach cancer, pancreatic cancer and Hodgkin's disease, and it has been shown to cause cancer in laboratory animals.

## EtO Exposure Limits

<i>Occupational Safety and Health Administration 2003 (OSHA)</i>	<ul style="list-style-type: none"> <li>•1 ppm time-weighted over 8 hours, with a short-term exposure limit (not to exceed 15 minutes) of 5 ppm</li> <li>•Excursion limit: 5 ppm (averaged over a 15-min. sampling period)</li> <li>•Action level: 0.5 ppm (calculated as an 8-hour TWA)</li> </ul>
<i>National Institute of Occupational Safety and Health 2003 (NIOSH)</i>	Less than 0.1 ppm EtO averaged over a 10-hr workday, 40-hr workweek
<i>American Conference of Governmental Industrial Hygienists 2003 (ACGIH)</i>	Designated EtO to be a suspected human carcinogen; threshold limit value (TLV) is 1 ppm as a time-weighted average (TWA) for a normal 8-hr workday, 40-hr workweek

Some potential high-EtO release sources include:

- compressed gas supply cartridge or cylinder leaks or failures,
- pressure-relief valve failure,
- sterilizer discharge line leaks,
- sterilizer or aerator door gasket leak,
- releases from the air gap between the pump discharge point and the sewer drain,
- residual EtO in the sterilization chamber due to exhaust failure or inadequate purging, and
- residual EtO release during sterilizer unloading and transfer to the aerator.

3 vent areas that should be monitored for EtO leaks:

- sterilization chamber vents
- chamber exhaust vents
- aeration room vents

## Environmental Monitoring

According to OSHA (29 CFR 1910.1047), employers must conduct air monitoring to determine whether employee exposures are within the excursion limit. Air samples must be taken from the breathing zone and must be representative of the 15 minute short-term exposures of each employee.

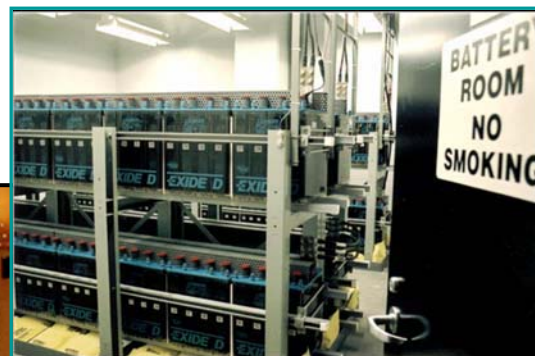
OSHA also requires that employers restrict access to EtO areas to authorized personnel and that they implement a system to provide emergency warning in the event of a release.

29 CFR 1910.1047 also says that an EtO monitor alarm must be set to allow employees time to evacuate the work area before the EtO level exceeds OSHA's excursion limit (5 ppm for 15 min.)



# MSA Gas Monitoring Solutions

Gas Monitor	Gas	Detection Limit	Standard Range
EtOx II Monitor	Ethylene oxide	0.1 ppm	0-10 ppm
Ultima X Monitor	Ethylene oxide	0.1 ppm	0-10 ppm
Chemgard Monitor	Ethylene oxide	3 ppm	0-1000 ppm
Ultima X Monitor	Oxygen	0.1 %	0-25 %
Toxgard® II Monitor	Oxygen	0.1 %	0-25 %
AirOx IAQ Monitor	Carbon dioxide	100 ppm	0-2000 ppm
Chillgard Monitors	Refrigerants	1 ppm	0-1000 ppm
Ultima X Monitor	Carbon monoxide	1 ppm	0-100 ppm, 0-500 ppm
Toxgard II Monitor	Carbon monoxide	1 ppm	0-100 ppm, 0-500 ppm
Chemgard Monitor	Nitrous oxide	3 ppm	0-1000 ppm
Ultima X Monitor	Hydrogen	1% LEL	0-100% LEL



Note: This Data Sheet contains only a general description of the product shown. While uses and performance capabilities are described, under no circumstances should the product be used except by qualified, trained personnel, and not until the instructions, labels or other literature accompanying the product have been carefully read and understood and the precautions therein set forth followed. Only they contain the complete and detailed information concerning this product.  
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