

# Macurco Nitrogen Dioxide

*Gas Detection. It's What We Do.*

# Macurco Gas Detection Products

- Nitrogen Dioxide (NO<sub>2</sub>) and Diesel Exhaust Training



# Nitrogen Dioxide (NO<sub>2</sub>) Training

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# Nitrogen Dioxide: A Gaseous Air Pollutant

- Nitrogen dioxide (NO<sub>2</sub>) is a reddish-brown gas with a pungent, acrid odor and is one of a group of highly reactive gasses known as nitrogen oxides or “NO<sub>x</sub>” (knocks)
- NO<sub>2</sub>, is a gaseous air pollutant composed of nitrogen and oxygen that forms when fossil fuels such as coal, oil, gas or diesel are burned at high temperatures
- NO<sub>2</sub> mixes in the outdoor air to form particle pollution and ozone. It is one of six widespread air pollutants that have national air quality standards to limit them in the outdoor air [www.lung.org](http://www.lung.org)
- NO<sub>2</sub> exposure concentrations are of particular concern for susceptible individuals, including asthmatics, children, and the elderly

# Nitrogen Dioxide Exposure

- While EPA's National Ambient Air Quality Standard (NAAQS) covers this entire family, NO<sub>2</sub> is the component of greatest interest and the indicator for the larger group of nitrogen oxides
- NO<sub>x</sub> react with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death
- Studies show a connection between breathing elevated short-term NO<sub>2</sub> concentrations, and increased visits to emergency departments and hospital admissions for respiratory issues, especially asthma

# Nitrogen Dioxide Exposure

- People with the some of highest exposures at work include truck drivers, toll booth workers, miners, forklift drivers, heavy machinery operators, dock workers, garage workers and mechanics
- Health effects associated with nitrogen dioxide exposure (NO<sub>2</sub>) include eye, nose, and throat irritation. It may cause impaired lung function and increased respiratory infections in young children
- Low concentrations (4ppm) will anesthetize the nose, thus creating a potential for overexposure
- Extremely high-dose exposure to NO<sub>2</sub> may result in pulmonary edema and diffuse lung injury [www.epa.gov](http://www.epa.gov)

# Nitrogen Dioxide and Diesel Fuel

- Diesel is a type of fuel derived from crude oil. Large engines, including those used in many trucks, buses, trains, construction and farm equipment, generators, ships, and in some cars, run on diesel fuel
- The gas portion of diesel exhaust is mostly carbon dioxide, carbon monoxide, nitric oxide, nitrogen dioxide, sulfur oxides and hydrocarbons
- The higher average temperature of combustion of diesel engines generates more nitrogen oxides than gasoline engines
- Pollution from diesel engines, heavy-duty trucks and buses account for about one-third of NOx emissions from mobile sources

# Diesel Fuel

- Diesel is the most widely used fuel for public buses and school buses throughout the United States and 94% of goods are shipped using diesel-powered vehicles
- Diesel fuel accounted for about 7% of all energy used in the United States in 2009 and 17% of all petroleum products, the second largest petroleum product after gasoline
- The military uses diesel for fighting vehicles like tanks and trucks and many industrial facilities, buildings, institutions, hospitals and utilities have diesel generators for backup and emergency power supply
- NIOSH estimates that approximately 1.35 million workers are occupationally exposed to the combustion products of diesel fuel in approximately 80,000 workplaces in the United States



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# Nitrogen Dioxide Exposure Limits

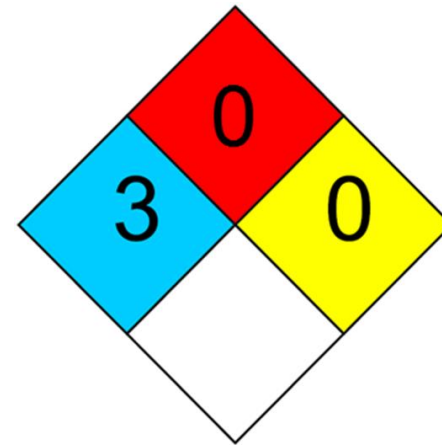
## Exposure Limits and Health Effects

Exposure Limit	Limit Values	HE Codes	Health Factors and Target Organs
<b>OSHA Permissible Exposure Limit (PEL) - General Industry</b> See <a href="#">29 CFR 1910.1000 Table Z-1</a>	5 ppm (9 mg/m <sup>3</sup> ) Ceiling	HE10	Chronic bronchitis, emphysema
		HE15	Eye, nose, and upper respiratory irritation
<b>OSHA PEL - Construction Industry</b> See <a href="#">29 CFR 1926.55 Appendix A</a>	5 ppm (9 mg/m <sup>3</sup> ) Ceiling	HE10	Chronic bronchitis, emphysema
		HE15	Eye, nose, and upper respiratory irritation
<b>OSHA PEL - Shipyard Employment</b> See <a href="#">29 CFR 1915.1000 Table Z-Shipyards</a>	5 ppm (9 mg/m <sup>3</sup> ) Ceiling	HE10	Chronic bronchitis, emphysema
		HE15	Eye, nose, and upper respiratory irritation
<b>National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL)</b>	1 ppm (1.8 mg/m <sup>3</sup> ) STEL	HE7	Mild headache
		HE10	Bronchiolitis obliterans
		HE11	Acute pulmonary edema; lower respiratory irritation
		HE15	Eyes, nose, and throat irritation
<b>American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) (2012)</b>	0.2 ppm (0.38 mg/m <sup>3</sup> ) TWA  A4	HE11	Lower respiratory irritation
<a href="#">CAL/OSHA PEL</a>	1 ppm (1.8 mg/m <sup>3</sup> ) STEL		

# Nitrogen Dioxide Hazards Identification

- Health Hazards:
  - Exposures to this gas mixture may result in severe irritation and burns of eyes, skin, mucous membranes, and any other exposed tissue.
  - Delayed pulmonary damage and breathing difficulty may occur.
  - Severe over-exposures can be fatal.

NFPA RATINGS (SCALE 0-4):  
HEALTH=3 FIRE=0 REACTIVITY=0



**Flammability Hazards:** This gas mixture is not flammable.

**Reactivity Hazards:** This gas mixture is not reactive.

# Diesel Exhaust and Lung Cancer

- Lung cancer is the major cancer thought to be linked to diesel exhaust. Several studies of workers exposed to diesel exhaust have shown small but significant increases in risk of lung cancer
- Men with the heaviest and most prolonged exposures, such as railroad workers, heavy equipment operators, and truck drivers, have been found to have higher lung cancer death rates than unexposed workers
- Although most studies have found a link between diesel exhaust exposure and lung cancer, some have not. Still, based on the number of people exposed at work, diesel exhaust may pose a health risk
- The possible link between lung cancer and exposure to diesel exhaust outside of the workplace has not been studied extensively

# Diesel Exhaust and Lung Cancer

- Several national and international agencies study substances in the environment to determine if they can cause cancer. The American Cancer Society looks to these organizations to evaluate the risks based on evidence from laboratory, animal, and human research studies
- Some of these expert agencies have classified diesel exhaust as to whether it can cause cancer, based largely on the possible link to lung cancer
- The EPA classifies diesel exhaust as “likely to be carcinogenic to humans.”
- The National Institute for Occupational Safety and Health (NIOSH) has determined that diesel exhaust is a “potential occupational carcinogen.”

# Diesel Exhaust and Lung Cancer

- The International Agency for Research on Cancer (IARC) is part of the World Health Organization (WHO). Its major goal is to identify causes of cancer. IARC classifies diesel engine exhaust as “carcinogenic to humans,” based on sufficient evidence that it is linked to an increased risk of lung cancer, as well as limited evidence linking it to an increased risk of bladder cancer
- The National Toxicology Program (NTP) is formed from parts of several different US government agencies, including the National Institutes of Health (NIH), the Centers for Disease Control and Prevention (CDC), and the Food and Drug Administration (FDA). The NTP has classified exposure to diesel exhaust particulates as “reasonably anticipated to be a human carcinogen,” based on limited evidence from studies in humans and supporting evidence from lab studies [www.cancer.org](http://www.cancer.org)



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