



Aceti-Oxígeno, S.A.

FABRICANTES DE GASES PARA USO MÉDICO, ALIMENTICIO E INDUSTRIALES

MATERIAL SAFETY DATA SHEET

(MSDS MATERIAL SAFETY DATA SHEET)

Annex 14

NITROUS OXIDE

1. Product and company identification

- | | | |
|------|-----------------------|--|
| 1.1 | Product name: | Nitrous Oxide |
| 1.2 | Common chemical name: | Hyponitrous Anhydride |
| 1.3 | IUPAC chemical name: | Nitrous Oxide |
| 1.4 | Chemical family: | Family of oxidizing gases |
| 1.5 | Condensed formula: | N ₂ O |
| 1.6 | Synonyms: | Synonyms: Dinitrogen Monoxide, Laughing Gas, Nitrogen Protoxide, Nitrous Oxide USP |
| 1.7 | Company name: | Aceti-Oxígeno, S.A. |
| 1.8 | Company address: | Panama Mañanitas-Industrial Zone |
| 1.9 | Telephone: | Tel. 321-8888 |
| 1.10 | Emergency Telephone: | 103 Fire Brigade |
| 1.11 | REVISION DATE: | June 20. of 2022, rev. 1, valid until: June 20, 2027 |
| 1.12 | Use: | Medical, Industrial, Food and Analytical |

2. Composition or information on ingredients

- | | | |
|-----|-------------------------------|---------------|
| 2.1 | Ingredient name: | Nitrous Oxide |
| 2.2 | CAS ^[1] Number: | 10024-97-2 |
| 2.3 | Percentage: | > 99% |
| 2.4 | OSHA PEL-TWA ^[2] : | None |
| 2.5 | ACGIH TLV ^[3] : | 50 ppm |
| 2.6 | [LD ₅₀]: | None |
| 2.7 | [LC ₅₀]: | None |

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Note: NIOSH recommends a TWA of 25 ppm during anaesthesia administration and 50 ppm in dental clinics.

- [1] Chemical Abstracts Service (International Material Identification Number according to the Chemical Abstracts Service)
- [2] Occupational Safety and Health Administration. Permissible Exposure Limits. Time Weighted Average (Occupational Safety and Hygiene Administration. Permissible Exposure Limits. Time weighted average exposure)
- [3] American Conference of Governmental Industrial Hygienists. Threshold Limit Value (North American Conference of Governmental Industrial Public Health. Threshold Limit Value)

3. Risk identification

- | | |
|-------|--|
| 3.1 | High pressure oxidizing liquid and gas |
| 3.1.2 | Vigorous acceleration of combustion |
| 3.1.3 | Can quickly cause suffocation |
| 3.1.4 | Has anaesthetic effects |

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Panama, July 28, 2022.

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- 3.1.5 May cause cryogenic injury (instantaneous freezing injury to tissues and loss of tissue integrity)
- 3.2 Information on potential health effects
- 3.2.1 Exposure Routes
- 3.2.1.1 Inhalation: Simple asphyxiant. Nitrous oxide is not toxic but can cause suffocation by displacing oxygen from the air. Exposure to atmospheres deficient in oxygen (less than 19.5%) can cause dizziness, drowsiness, nausea, vomiting, excessive salivation, decreased alertness, loss of consciousness, and death. Severe oxygen deficiency can cause serious damage and even death. Exposure to atmospheres containing 8 to 10% oxygen or less will produce unconsciousness without warning and so rapidly that the individual is unable to help or protect himself. The lack of sufficient oxygen can cause serious brain damage and death.
- Exposure to Nitrous Oxide concentrations greater than 50% will produce euphoria, loss of coordination, inconsistent verbal expression, saturation of the senses, loss of consciousness and clinical anaesthesia. These symptoms may suggest intoxication (hence the name Laughing Gas). At higher concentrations, reaching 100%, inhalation can cause deep breathing, dizziness, nausea, and Central Nervous System depression.
- Warning:** Misuse of Nitrous Oxide can cause death by reducing the amount of oxygen needed to sustain life. Nitrous Oxide abuse can impair an individual's ability to make and implement life-sustaining decisions.
- 3.2.1.2 Contact with eyes: Contact with cold liquid or gas may cause cryogenic injury.
- 3.2.1.3 Absorption through the skin: Not applicable because before any absorption there is cryogenic injury.
- 3.2.1.4 Ingestion: Not applicable because before any ingestion there is cryogenic injury to the mouth and pharynx.
- 3.2.2 Chronic effects: Nitrous Oxide has been associated with different effects of long-term exposure. The most frequent effect is neuropathy (degenerative changes in the Central Nervous System, with the most attended complaints being those related to tingling of the hands and legs, loss of sensation in the fingers, inability to balance the body and muscle weakness. Epidemiological studies have also suggested fetotoxic effects and a high incidence of spontaneous abortions in exposed female personnel. Although a consistent cause-effect relationship has not been established, occupational exposure to the gas should be minimized.
- 3.2.3 Medical conditions aggravated by overexposure: Pregnant women should avoid exposure to Nitrous Oxide. See Section 11, Toxicological Information.
- 3.2.4 Other effects of overexposure: See Section 11, Toxicological Information
- 3.2.5 Carcinogenicity: Nitrous Oxide is not listed by NTP^[4], OSHA or IARC^[5]

[4] National Toxicology Program
 [5] International Agency for Research on Cancer

4. First aid

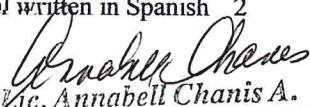
- 4.1 Inhalation: Move person to fresh air. If the person is not breathing, administer artificial respiration (PCR). Vomiting may occur upon regaining consciousness. To avoid aspiration, the exposed person should remain lying on their side with their head at or slightly below the level of their body. If respiratory distress or saturation of the senses is observed, administer oxygen. Immediately call a doctor.

Rescue personnel should be warned of the extreme fire hazards associated with atmospheres enriched with oxidizing agents.

- 4.2 Contact with eyes: Contact with liquid Nitrous Oxide or the cold gas can cause frostbite of eye tissues. Wash eyes with plenty of lukewarm water and seek immediate medical attention, preferably from an ophthalmologist.

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- 4.3 Skin Contact: Contact with liquid Nitrous Oxide or cold gas may cause cryogenic injury. Wash affected area with plenty of lukewarm water not to exceed 105°F (40°C). Get immediate medical attention. During the time that medical attention is obtained, it is recommended to cover the affected area with glycerine or glycerol and place a temporary sterile gauze.
- 4.4 Ingestion: Not applicable because cryogenic injury to the lips and oral mucosa will occur first.
- 4.5 Notes to Physician: Nitrous Oxide may suppress immune function when administered for aesthetic purposes, which may result in reduced resistance to infection and affect other immune-dependent disease processes. Prolonged use of Nitrous Oxide can cause Vitamin B-12 deficiency. As a consequence of this chemically induced deficiency, anaemia megaloblastic and disorders of the nervous system can occur. More detailed information can be found in Section 11, Toxicological Information.

5. Measures in case of fire

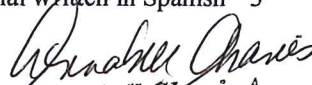
- 5.1 Ignition point: Not applicable because it is a gas.
- 5.2 Auto ignition: Not applicable
- 5.3 Flammable limits in air, volume by volume:
- 5.3.1 Lower: Not applicable
- 5.3.2 Superior: Not applicable
- 5.4 Extinguishing media: Nitrous Oxide is non-flammable, but accelerates combustion. Use appropriate extinguishing media for the surrounding flammable materials.
- 5.5 Special instructions to firefighters: Evacuate all personnel from the danger area. If possible, cut off the flow of Nitrous Oxide that is fueling the fire. Immediately cool containers with water spray for maximum operating distance. When cool, the containers should be removed from the fire area if applicable.
- 5.6 Unusual fire and explosion hazards: Oxidizing agent that vigorously accelerates combustion. Some materials that are not flammable in air will burn readily in an atmosphere enriched with Nitrous Oxide. May form explosive compounds when in contact with combustible materials such as oil, grease, and other hydrocarbons. Under exposure to intense heat or direct flame, cylinders will rapidly vent or rupture violently. Most cylinders are designed to vent their contents when subjected to very high temperatures. Pressure in a container can rise due to heat, which can cause it to rupture if pressure relief devices fail to function.
- 5.7 Hazardous Combustion Products: None
- 5.8 Sensitivity to static discharge: None
- 5.9 Sensitivity to mechanical impact: None.

6. Measures in case of accidental release

- 6.1 Steps to be taken if material is released or spilled:
- 6.1.1 Evacuate all unnecessary personnel from the damage area.
- 6.1.2 Cut or close the source of Nitrous Oxide when possible
- 6.1.3 Eliminate sources of heat or ignition and, if possible, separate combustible materials from any oxygen leaks.
- 6.1.4 Ventilate confined areas or remove leaking container to a well-ventilated area. If the cylinder leaks from the valve, contact Productos del Aire de Guatemala, S. A.

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7. Handling and storage

- 7.1 Precautions for storage
 - 7.1.1 Store and use with adequate ventilation.
 - 7.1.2 Oxygen and other oxidizing gas cylinders must be separated from combustible gas cylinders by a minimum distance of 20 feet (6 meters) or by a barrier of non-combustible material at least 5 feet high (1.52 meters) that has a fire resistance rate of at least half an hour.
 - 7.1.3 Place "No Smoking" or "Avoid Open Flames" signage in the storage area. Protect cylinders from physical damage
 - 7.1.4 Cylinders must be stored upright with the valve protection cap in place, properly secured to prevent them from falling or being hit.
 - 7.1.5 Protect cylinders from any physical damage. Do not drag, roll, slide or drop them.
 - 7.1.6 Do not allow storage temperature to exceed 125°F (52°C).
 - 7.1.7 Full and empty cylinders must be separated.
 - 7.1.8 Use a FIFO (first-in, first-out) inventory system to prevent full cylinders from being stored for long periods of time.
 - 7.1.9 Due to its anaesthetic properties and its "laughing gas" characteristic that makes it a product for various abuses, Nitrous Oxide is subject to theft and abuse of its effects, so the cylinders must remain and be used in a controlled area.
- 7.2 Precautions to be taken in handling
 - 7.2.1 Use a handcart or four-wheel cart for moving gas and liquid cylinders, respectively.
 - 7.2.2 Never attempt to lift a cylinder by the protective valve cap.
 - 7.2.3 Keep the cylinders and their valves free of oil and grease.
 - 7.2.4 For use, open the valve slowly.
 - 7.2.5 Any difficulty in the operation of the valve implies discontinuing its use and contacting Aceti-Oxígeno, S.A.
 - 7.2.6 Never insert an object (a tool such as a wrench, a screwdriver, etc.) into the openings of the valve protection cap, as it may be damaged and cause product leakage.
 - 7.2.7 Do not hit the valve protection cap with a hammer. Use an adjustable strap wrench to remove rusted or overtightened plugs.
 - 7.2.8 Never bring an electric arc near a compressed gas cylinder or make it part of an electrical circuit.
 - 7.2.9 Use an adjustable wrench to remove rusted or overtightened valve plugs or protectors.
 - 7.2.10 For additional precautions in the use of Nitrous Oxide, see Section 16. Other Information.

8. Exposure control and personal protection

- 8.1 Infrastructure controls
 - 8.1.1 Ventilation: Natural or mechanical ventilation is required to prevent the formation of enriched atmospheres in the breathing zone of workers that contain levels of Nitrous Oxide above the exposure limits (See Section 2).
- 8.2 Respiratory protection
 - 8.2.1 General routine use: Not required
 - 8.2.2 Use in emergencies: Self-contained breathing apparatus or positive pressure airlines should be used with your mask. Air purifying respirators will not provide any protection.
- 8.3 Protective gloves: It is recommended to wear work gloves when handling cylinders. If used, gloves must be clean and free of oil and grease.
- 8.4 Eye protection: The use of safety glasses is recommended for handling the cylinders.
- 8.5 Other protective equipment: The use of safety footwear is recommended for handling cylinders.

9. Physical and chemical properties

- 9.1 Molecular weight: 44.0128 g/mol (as weighted average molecular weight of its main components)
- 9.2 Boiling point (1 atmospheric pressure): -127.4 °F (-88.5 °C)
- 9.3 Specific gravity (Air = 1) at 70°F (21.1°C) and 1 atmospheric pressure: 1.530
- 9.4 Melting point (1 atmospheric pressure): -131.5 °F (-90.8 °C)
- 9.5 Vapor pressure at 70°F (21.1°C): 735 psig (5069 KPa)
- 9.6 Gas density at 70°F (21.1°C) and 1 atmospheric of pressure: 0.1146 lb/cf or 1.947 Kg/m3
- 9.7 Evaporation rate (Butyl Acetate = 1): Not applicable as it is a gas.
- 9.8 Water solubility:
- 9.8.1 Vol/Vol at 32°F (0°C) and 1 atmospheric pressure: 1.3000
- 9.9 Expansion ratio: Not applicable
- 9.10 pH: Not applicable
- 9.11 Appearance, odor and condition: Colorless gas with a sweetish taste and odor at normal temperature and pressure.
- 9.12 Water/oil distribution coefficient: Not applicable
- 9.13 Odor threshold: Not known

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10. Stability and reactivity

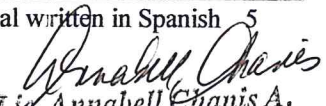
- 10.1 Stability: Stable
- 10.2 Conditions to avoid: Excess heat, as it decomposes at high temperature (1202 °F or 650 °C) to produce nitrogen and oxygen. This reaction can occur at low temperature in the presence of catalytic surfaces such as silver, platinum, cobalt, copper or nickel oxides.
- 10.3 Incompatibilities (materials to avoid): Avoid flammable materials, hydrocarbons, oils and greases, asphalt, ethers, alcohols, organic acids and aldehydes. Likewise, alkaline metals, boron, tungsten carbide and aluminum should be avoided.
- 10.4 Reactivity:
- 10.4.1 Hazardous decomposition products: None. Thermal-decomposition generates Oxygen and Nitrogen.
- 10.4.2 Hazardous polymerization products: Will not occur

11. Toxicological information

Exposure to Nitrous Oxide has been shown to produce embryo-fetal toxicity in animals, evidenced by reduced fetal weight, delayed ossification, and increased incidence of visceral and skeletal variations. Exposure is associated with an increased incidence of abortion in humans. Simple prolonged exposure to high concentrations of Nitrous Oxide has produced bone marrow damage and adverse effects on blood cellularity.

- 11.1 Ability to cause irritation: None
- 11.2 Material Sensitization: None
- 11.3 Reproductive Effects: None
- 11.4 Teratogenicity: None
- 11.5 Mutagenicity: None

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11.6 Synergistic Materials: None

12. Ecological information

No adverse or negative ecological impacts are expected. Nitrous Oxide does not contain Class I or Class II chemicals, which deplete the ozone layer (40 CFR ^[6] Part 82). Nitrous Oxide is not listed as a marine pollutant by DOT ^[7] (49 CFR Part 171). It is considered a gas responsible for global warming.

Global warming capacity according to the caloric base of CO₂: 230x

^[6] Code of Federal Regulations (United States Code of Federal Regulations)

^[7] Department of Transportation of the United States of America

13. Disposal considerations

13.1 Waste disposal method: Do not attempt to dispose of residual or unused amounts. Return the cylinder to the supplier.

13.2 For emergency disposal, secure cylinder and slowly discharge gas to atmosphere in a well-ventilated area or outdoors.

14. Transport information

14.1 DOT/IMO shipping name: Nitrous Oxide.

14.2 Hazard classification: 2.2 (Non-flammable Gas)

14.3 Identification number: UN 1070

14.4 Product identification number: 1070

14.5 Product reportable quantity: Not applicable

14.6 Shipping labels: Non-flammable and oxidant gas

14.7 Placard: Non-flammable Gas

14.8 Special shipping information: Cylinders must be transported in a secure upright position, in a well-ventilated vehicle. The transport of compressed gases in automobiles or closed body vehicles can present great safety risks and should not be recommended or encouraged.

15. Related regulations

The following information is related to United States regulatory requirements potentially applicable to this product in Panama. Users of this product are responsible for complying with their local or general regulatory requirements.

15.1 United States Federal Regulations

15.1.1 EPA - Environmental Protection Agency

15.1.1.1 CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (40 CFR Parts 117 and 302). Reportable Quantity RQ: Not applicable

15.1.1.2 SARA: Superfund Amendment and Reauthorization Act

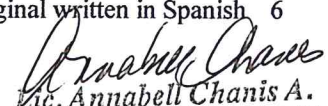
Section 302/304: Requires emergency planning based on Threshold Planning Quantities (TPQ) and release reporting based on Reportable Quantities (RQ) of EPA-scheduled substances as extremely hazardous (40 CFR Part 355)

Extremely Hazardous Substance: Not Applicable

Planning Threshold Quantity: Not applicable

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Section 311/312: Requires the submission of a Material Safety Data Sheet (MSDS) and a chemical inventory report with identification of the risk classes defined by the EPA (40 CFR Part 370). The hazard classes for this product are:

Immediate: Yes
Late: Yes
Pressure: Yes
Reactivity: No
Fire: Yes

Section 313: Requires submission of annual toxic chemical release reports listed in 40 CFR Part 372. Nitrous Oxide is not required to report under this Section.

- 15.1.2 40 CFR Part 68: Risk Management for Chemical Accidental Release: Requires the development and implementation of risk management programs in manufacturing facilities, use, storage, or any other Controlled substance handled in amounts exceeding specified thresholds. Nitrous Oxide is not listed as a regulated substance.
- 15.1.3 TSCA Toxic Substance Control Act: Nitrous Oxide is listed on the inventory of controlled products by TSCA.
- 15.2 OSHA Occupational Safety and Health Administration
- 15.2.1 29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals: Requires facilities to develop Process Safety Management based on Threshold Quantities (TQ) of products high-risk chemicals, such as those listed in Appendix A. Nitrous Oxide is not listed in Appendix A as a high-risk chemical.
- 15.3 FDA (Food and Drug Administration)
- 15.3.1 21 CFR 184.1545: Recognized as Safe (GRAS) as a direct human food ingredient when used as a propellant, aerating agent, dispersing agent in dairy. Nitrous Oxide is regulated by the FDA as a prescription drug.

16. Additional information

- 16.1 Special precautions: All pressure gauges, regulators, piping and equipment to be used with Nitrous Oxide must be properly cleaned as indicated in the CGA G-4.1 standard. Use piping and equipment designed to resist oxidative capacity and working pressure. Nitrous Oxide can cause deformation of certain elastomers. Use a check valve or other protective device on any distribution line or piping from the source to prevent reverse flow from occurring.

Shipping compressed gas cylinders that have not been filled with the consent of the cylinder owner is a violation of US federal law [49 CFR Part 173.301(b)].

- 16.2 Mixtures: When two or more gases or liquefied products are mixed, their properties can combine to create additional unexpected hazards. Obtain and evaluate the safety information for each component before manufacturing the mixture. Seek advice from an industrial health worker or other qualified person, when carrying out the safety evaluation of the final product. Remember that gases and liquids have properties that can cause severe harm or death.

- 16.3.1 NFPA Valuation
- | | |
|--------------|--------------|
| Health | 2 |
| Flammability | 0 |
| Instability | 0 |
| Special | OX (Oxidant) |

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16.3.2 HMIS Valuation (Hazardous Materials Identification Systems, Hazardous Materials Identification System)

Health	2
Flammability	0
Reactivity	0

Classification of the chemical substance according to the SGA:

Physical hazards: Gases under pressure – Liquefied gas.

Oxidizing gases – Category 1.

Health Hazards: N/A.

Environmental Hazards: N/A

Elements for the communication and signalization of hazards:

Word of warning: Danger

Hazard statements:

H280: Contains gas under pressure; may explode if heated.

H270: May cause or aggravate fire; oxidising.

Precautionary advice:

Prevention:

P220: Keep/Store away from clothing and other combustible and incompatible materials.

P244: Keep valves and connections free of oil and grease.

Response:

P370+P376: In case of fire, stop leak if it can be done without risk.

Storage:

P410+P403: Protect from sunlight. Store in a well-ventilated place.

Elimination: N/A.

Other dangers:

May cause drowsiness or dizziness.

It is not a flammable gas, but it easily supports combustion.

All materials that are flammable in air will burn vigorously in combination with this product.

At elevated temperatures this product decomposes into oxygen and nitrogen.

Some fuels, such as oil and grease, burn with near-explosive violence when combined with oxygen.

May ignite other combustible materials (wood, paper, oil, clothing, etc.).

Ruptured cylinders can be projected.

Leakage resulting from the control may create a fire or explosion hazard.

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Pictogram/ Hazard Symbol:



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- 16.4 Standard valve connection for the United States and Canada
- 16.4.1 Coiled: Standard CGA 326 for cylinders filled between 0-3000 psig. For Panama the standard is CGA 326.
- 16.4.2 Indexed Pin Yoke: CGA Standard 910 (for medical uses) for cylinders between 0 and 3000 psig.
- 16.4.3 Ultra High Integrity: CGA Standard 712 for cylinders between 0 and 3000 psig.

Use the proper CGA connection. DO NOT USE ADAPTERS.

More detailed information on oxygen can be found in the following documents published by the Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Phone (703) 412-0900:

G-4.1	Cleaning Equipment for Oxygen Service
G-8.1	Standard for Nitrous Oxide Systems at consumer Sites
G-8.2	Commodity Specification for Nitrous Oxide
P-1	Safe Handling of Compressed Gases in Containers
SB-2	Oxygen-Deficient Atmospheres
SB-6	Nitrous Oxide Security and Control

COMPATIBILITY WITH OTHER MATERIALS

Metals

Bronze	Satisfactory
303 Stainless Steel	Satisfactory below 1000 psig
316 Stainless Steel	Satisfactory below 1000 psig
Aluminum	Unsatisfactory
Zinc	Satisfactory
Copper	Satisfactory
Monel-metal	Satisfactory

Plastics

PCTFE	Satisfactory
Teflon	Unsatisfactory
Tefzel	Satisfactory
Kynar	Satisfactory
PVC	Satisfactory
Polycarbonate	Unsatisfactory

Elastomers

Kalrez	Consult with E.I. DuPont.
Viton	Satisfactory
Buna-N	Satisfactory
Neoprene	Satisfactory
Polyurethane	Satisfactory

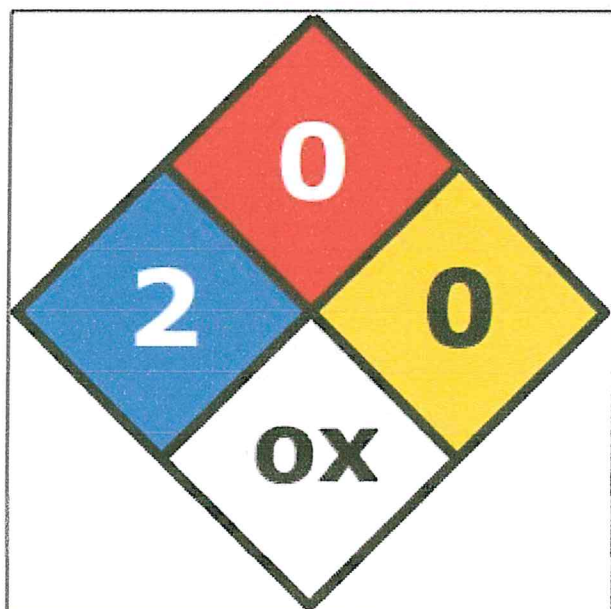
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Conversion Table

NITROUS OXIDE (N ₂ O) 44.0139 g/mol PE=-88.47 °C						
UNITS	WEIGHT		GAS VOLUME		LIQUID VOLUME	
	Pounds	Kilograms	SCF Gas	Nm ³ Gas	Liquid gallons	Liquid liters
Pounds	1.000	0.454	8.726	0.229	0.114	0.431
Kilograms	2.205	1.000	19.238	0.506	0.251	0.950
SCF Gas	0.115	0.052	1.000	0.026	0.013	0.049
Nm ³ Gas	4.359	1.977	38.040	1.000	0.497	1.879
Liquid gallons	8.778	3.982	76.600	2.013	1.000	3.785
Liquid liters	2.319	1.052	20.236	0.532	0.264	1.000



Change control:

Revision 01:

- Added safety color code for NFPA and the global harmonized system.
- The format was modified to the standards and approved by the sister companies Infra and Productos del Aire.

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