

Product: Oxygen

Form No.: P-4638-D

Date: October 1997

Praxair™ Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name:	Oxygen (MSDS No. P-4638-D)	Trade Name:	Oxygen
Chemical Name:	Oxygen	Synonyms:	Not applicable
Formula:	O ₂	Chemical Family:	Not applicable
Telephone:	Emergencies: 1-800-645-4633* CHEMTREC 1-800-424-9300* Routine: 1-800-PRAXAIR	Company Name:	Praxair, Inc. 39 Old Ridgebury Road Danbury CT 06810-5113

*Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

2. Composition / Information on Ingredients

For custom mixtures of this product request a Material Safety Data Sheet for each component. See Section 16 for important information about mixtures.

INGREDIENT NAME	CAS NUMBER	PERCENTAGE	OSHA PEL	ACGIH TLV-TWA
Oxygen	7782-44-7	>99%*	None currently established	None currently established

*The symbol ">" means "greater than."

3. Hazards Identification

EMERGENCY OVERVIEW

WARNING! High-pressure, oxidizing gas.
Vigorously accelerates combustion.
Self-contained breathing apparatus may
be required by rescue workers.
Odor: None

THRESHOLD LIMIT VALUE: None currently established—ACGIH 1997 recommends a TLV-TWA of 0.5 mg/m³ for welding fumes not otherwise classified (NOC) that may be generated during welding with this product. See section 16 for more information on welding hazards.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION—Breathing 80% or more oxygen at atmospheric pressure for more than a few hours may cause nasal stuffiness, cough, sore throat, chest pain and breathing difficulty. Breathing oxygen at

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higher pressure increases the likelihood of adverse effects within a shorter time period. Breathing pure oxygen under pressure may cause lung damage and also central nervous system effects resulting in dizziness, poor coordination, tingling sensation, visual and hearing disturbances, muscular twitching, unconsciousness and convulsions. Breathing oxygen under pressure may cause prolongation of adaptation to darkness and reduced peripheral vision.

SKIN CONTACT—No harm expected.

SWALLOWING—This product is a gas at normal temperature and pressure.

EYE CONTACT—No harm expected.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: No harm expected.

OTHER EFFECTS OF OVEREXPOSURE: See section 11, Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: See section 11, Toxicological Information.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: None known.

CARCINOGENICITY: Oxygen is not listed by NTP, OSHA, or IARC.

4. First Aid Measures

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. Keep victim warm and at rest. Call a physician. Advise the physician that the victim has been exposed to a high concentration of oxygen.
SKIN CONTACT: No emergency care anticipated.

SWALLOWING: This product is a gas at normal temperature and pressure.

EYE CONTACT: No emergency care anticipated.

NOTES TO PHYSICIAN: Supportive treatment should include immediate sedation, anti-convulsive therapy if needed, and rest. See section 11, Toxicological Information.

5. Fire Fighting Measures

FLASH POINT (test method)	Not applicable	AUTOIGNITION TEMPERATURE	Not applicable
FLAMMABLE LIMITS IN AIR, % by volume	LOWER	Not applicable	UPPER Not applicable

EXTINGUISHING MEDIA: Vigorously accelerates combustion. Use media appropriate for surrounding fire. Water (e.g. safety shower) is the preferred extinguishing media for clothing fires.

SPECIAL FIRE FIGHTING PROCEDURES:

WARNING! High-pressure, oxidizing gas. Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool, then move them away from fire area if without risk. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Oxidizing agent; vigorously accelerates combustion. Contact with flammable materials may cause fire or explosion. Heat of fire can build pressure in cylinder and cause it to rupture. Oxygen cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) No part of a cylinder should be subjected to a temperature higher than

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125F (52C). Smoking, flames, and electric sparks in the presence of enriched oxygen atmospheres are potential explosion hazards.

HAZARDOUS COMBUSTION PRODUCTS: None known.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

WARNING! High-pressure, oxidizing gas. Shut off flow if without risk. Ventilate area or move cylinder to well-ventilated area. Remove all flammable materials from vicinity. Oxygen must never be permitted to strike an oily surface, greasy clothes, or other combustible material.

WASTE DISPOSAL METHOD: Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation, away from oil, grease, and other hydrocarbons. Separate oxygen cylinders from flammables by at least 20 feet or use a barricade of noncombustible material. This barricade should be at least 5 feet high and have a fire resistance rating of at least ½ hour. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

PRECAUTIONS TO BE TAKEN IN HANDLING: Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. Never apply flame or localized heat directly to any part of the cylinder. High temperatures may damage the cylinder and could cause the pressure relief device to fail prematurely, venting the cylinder contents. Never strike an arc on a compressed gas cylinder or make a cylinder part of an electrical circuit. For other precautions in using oxygen, see section 16.

Precautions when using oxygen in welding and cutting: Read and understand the manufacturer's instructions and the precautionary labels on the products. See American National Standards Institute (ANSI) 749.1, *Safety in Welding and Cutting*, published by the American Welding Society, PO Box 351040, Miami, Florida 33135 and National Fire Protection Association (NFPA) 51, *Oxygen Fuel Gas Welding and Cutting*.

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST—Use a local exhaust system, if necessary, to prevent increased oxygen concentration and, in welding, to keep hazardous fumes and gases below applicable TLVs in the worker's breathing zone.

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MECHANICAL (general)—General exhaust ventilation may be acceptable if it can maintain a supply of air that is not too rich in oxygen and, during welding, can keep hazardous fumes and gases below the applicable TLVs in the worker's breathing zone.

SPECIAL—None

OTHER—None

RESPIRATORY PROTECTION: None required under normal use. However, air-supplied respirators are required while working in confined spaces with this product. For welding, use air-purifying or air-supplied respirators, as appropriate, where local or general exhaust ventilation is inadequate. Adequate ventilation must keep worker exposure below applicable TLVs for fumes, gases and other by-products of welding with oxygen. See sections 3, 10, and 16 for details. The respiratory protection use must conform with OSHA rules as specified in 29 CFR 1910.134.

SKIN PROTECTION: Wear work gloves when handling cylinders; welding gloves for welding. Gloves must be free of oil and grease.

EYE PROTECTION: Wear safety glasses when handling cylinders. For welding, wear goggles with filter lens selected as per ANSI Z49.1. Provide protective screens and goggles, if necessary, to protect others. Select as per OSHA 29 CFR 1910.33

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. As needed for welding, wear hand, head, and body protection to help prevent injury from radiation and sparks. (See ANSI Z49.1.) At a minimum this includes welder's gloves and protective goggles, and may include arm protectors, aprons, hats, shoulder protection, as well as substantial clothing. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Properties

MOLECULAR WEIGHT: 31.9988	EXPANSION RATIO: Not applicable
SPECIFIC GRAVITY (air=1): At 70°F (21.1°C) and 1 atm: 1.105	SOLUBILITY IN WATER: vol/vol at 32°F (0°C): 0.0491
GAS DENSITY: At 70°F (21.1°C) and 1 atm: 0.083279 lbs/ft ³ (1.326 kg/m ³)	VAPOR PRESSURE: AT 68°F (20°C): Not applicable
PERCENT VOLATILES BY VOLUME: 100	EVAPORATION RATE (Butyl Acetate=1): Gas, not applicable
BOILING POINT (1 atm): -297.33°F (182.96°C)	pH: Not applicable
FREEZING POINT (1 atm): -361.8°F (-218.78°C)	
APPEARANCE, ODOR, AND STATE: Colorless, odorless, tasteless gas at normal temperature and pressure.	

10. Stability and Reactivity

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HAZARDOUS DECOMPOSITION PRODUCTS: None.

HAZARDOUS POLYMERIZATION:	May Occur		Will Not Occur	X
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CONDITIONS TO AVOID: None currently known.

11. Toxicological Information

At atmospheric concentration and pressure, oxygen poses no toxicity hazards. At high concentrations, newborn premature infants may suffer delayed retinal damage (retrolental fibroplasia) that can progress to retinal detachment and blindness. Retinal damage may also occur in adults exposed to 100% oxygen for extended periods (24 to 48 hours) or at greater than atmospheric pressure, particularly in individuals whose retinal circulation has been previously compromised. All individuals exposed for long periods to oxygen at high pressure and all who exhibit overt oxygen toxicity should have ophthalmologic examinations.

At two or more atmospheres, toxicity to the Central Nervous System (CNS) occurs. Symptoms include nausea, vomiting, dizziness or vertigo, muscle twitching, vision changes, and loss of consciousness and generalized seizures. At three atmospheres, CNS toxicity occurs in less than two hours; at six atmospheres, in only a few minutes.

Patients with chronic obstructive pulmonary disease retain carbon dioxide abnormally. If oxygen is administered, raising their blood oxygen concentration, their breathing becomes depressed and retained carbon dioxide rises to a dangerous level.

Animal studies suggest that the administration of certain drugs, including phenothiazine drugs and chloroquine, increases the susceptibility to toxicity from oxygen at high concentrations or pressures. Animal studies also indicate that vitamin E deficiency may increase susceptibility to oxygen toxicity.

Airway obstruction during high oxygen tension may cause alveolar collapse following absorption of the oxygen. Similarly, occlusion of the eustachian tubes may cause retraction of the eardrum and obstruction of the paranasal sinuses may produce vacuum-type headache.

12. Ecological Information

No adverse ecological effects expected. Oxygen does not contain any Class I or Class II ozone-depleting chemicals. Oxygen is not listed as a marine pollutant by DOT.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier. For emergency disposal, secure cylinder in a well-ventilated area or outdoors, then slowly discharge gas to the atmosphere.

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14. Transport Information

DOT/IMO SHIPPING NAME: Oxygen, compressed

HAZARD CLASS: 2.2

IDENTIFICATION NUMBER: UN 1072

PRODUCT RQ: Not applicable

SHIPPING LABEL(s): OXYGEN. An oxygen label may be used for domestic shipment in the United States and Canada in place of the NONFLAMMABLE GAS and OXIDIZER labels (49 CFR Part 172).

PLACARD (When required): Nonflammable gas or oxygen

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (Environmental Protection Agency)

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): None

SARA: Superfund Amendment and Reauthorization Act:

- **SECTIONS 302/304:** Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of extremely hazardous substances (40 CFR Part 355):

Threshold Planning Quantity (TPQ): None.

Extremely Hazardous Substances (40 CFR 355): None.

- **SECTIONS 311/312:** Require submission of Material Safety Data Sheets (MSDSs) and chemical inventory reporting with identification of EPA hazard categories. The hazard categories for this products are as follows:

IMMEDIATE: No

PRESSURE: Yes

DELAYED: No

REACTIVITY: No

FIRE: Yes

- **SECTION 313:** Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Oxygen does not require reporting under Section 313.

40 CFR 68: Risk Management Program for Chemical Accidental Release Prevention: Requires development and implementation of risk management programs at facilities that manufacture,

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use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Oxygen is not listed as a regulated substance.

TSCA: Toxic Substances Control Act: Oxygen is listed on the TSCA inventory.

OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION):

29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Oxygen is not listed in Appendix A as a highly hazardous chemical.

STATE REGULATIONS:

CALIFORNIA: This product is not listed by California under the Safe Drinking Water Toxic Enforcement Act of 1986 (Proposition 65).

PENNSYLVANIA: This product is subject to the Pennsylvania Worker and Community Right-To-Know Act (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

WARNING: Medical grades of Oxygen are subject to strict federal regulation, and are for use only under the control of a licensed physician or clinician, familiar with the product and its hazards.

ADDITIONAL SAFETY AND HEALTH HAZARDS: *High-pressure, oxidizing gas.* Clean all gauges, valves, regulators, piping, and equipment to be used in oxygen service in accordance with CGA pamphlet G-4.1. Keep cylinders and their valves free of oil and grease. Use piping and equipment adequately designed to withstand pressures to be encountered. Close cylinder valve after each use; keep closed even when empty. *Never use oxygen as a substitute for compressed air.* Never use an oxygen jet for cleaning purposes of any sort, especially for clothing. Oxygen increases the likelihood of an engulfing fire. *Prevent reverse flow.* Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. *Never work on a pressurized system.* If there is a leak, close the cylinder valve. Blow the system down in a safe and environmentally sound manner in compliance with all federal, state and local laws; then repair the leak. *Never ground a compressed gas cylinder or allow it to become part of an electrical circuit.*

Personnel who have been exposed to high concentrations of oxygen should stay in a well-ventilated or open area before going into a confined space or near an ignition source.

SPECIAL PRECAUTIONS: *Use in welding and cutting.* Read and understand the manufacturer's instructions and the precautionary label on the product. See American Standard Z49.1, Safety in Welding and Cutting, published by the American Welding Society, PO Box 351040, Miami, FL 33135, and OSHA Publication 2206 (29CFR 1910), US Government Printing Office, Washington, DC 20402, for more information.

Arcs and sparks can ignite combustible materials. Prevent fires. Refer to NFPA 51B, "Cutting and Welding Processes." *Do not strike an arc on the cylinder.* The defect produced by an arc burn could lead to cylinder rupture.

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MIXTURES: When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist, or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:

HEALTH = 0
 FLAMMABILITY = 0
 REACTIVITY = 0
 SPECIAL = OX (Oxidizer)

HMIS RATINGS:

HEALTH = 0
 FLAMMABILITY = 0
 REACTIVITY = 0

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	0-3000 psig	CGA-540
	3001-4000 psig	CGA-577
	4001-5500 psig	CGA-701
PIN-INDEXED YOKE:	0-3000 psig	CGA-870 (Medical Use)
ULTRA-HIGH-INTEGRITY CONNECTION:	0-3000 psig	CGA-714

Use the proper CGA connections. **DO NOT USE ADAPTERS.**

Ask your supplier about free Praxair safety literature as referenced on the label for this product; you may also obtain copies by calling 1-800-PRAXAIR. Further information about oxygen can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 1725 Jefferson Davis Highway, Arlington, VA 22202-4102, Telephone (703) 412-0900.

- AV-1 *Safe Handling and Storage of Compressed Gases*
- AV-8 *Characteristics and Safe Handling of Cryogenic Liquid and Gaseous Oxygen*
- G-4.3 *Commodity Specification for Gaseous and Liquid Oxygen*
- G-4.1 *Cleaning Equipment for Oxygen Service*
- G-4.3 *Commodity Specification for Oxygen*
- P-1 *Safe Handling of Compressed Gases in Containers*
- P-2 *Characteristics and Safe Handling of Medical Gases*
- P-14 *Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmospheres*
- SB-2 *Oxygen-Deficient Atmospheres*
- SB-8 *Use of Oxy-Fuel Gas Welding and Cutting Apparatus*
- V-1 *Compressed Gas Cylinder Valve Inlet and Outlet Connections*
- *Handbook of Compressed Gases, Third Edition*

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The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current Praxair MSDSs for these products, contact your Praxair sales representative or local distributor or supplier. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (Phone: 1-800-PRAXAIR; Address: Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14150-7891).

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