

Product: Compressed gases, n.o.s. (argon, carbon dioxide, oxygen); Compressed gases, n.o.s. (argon, carbon dioxide, helium) P-6290-A Date: April 2006

Effects of Repeated (Chronic) Overexposure. No harm expected.

Other Effects of Overexposure. Damage to retinal or ganglion cells and central nervous system may occur (mixtures containing CO₂).

Medical Conditions Aggravated by Overexposure. The toxicology and the physical and chemical properties of the mixture components suggest that overexposure is unlikely to aggravate existing medical conditions.

CARCINOGENICITY: None of the components of these mixtures is listed by NTP, OSHA, or IARC.

POTENTIAL ENVIRONMENTAL EFFECTS: None known. For further information, see section 12, Ecological Information.

3. Composition/Information on Ingredients

See sections 8, 10, 11, and 16 for information on by-products generated during use in welding and cutting. See section 16 for important information about mixtures.

COMPONENT	CAS NUMBER	CONCENTRATION
Helium	7440-59-7	0-<40%*
Carbon Dioxide	124-38-9	<10%*
Oxygen	7782-44-7	0-<5%*
Argon	7440-37-1	>60%*

*The symbol > means "greater than"; the symbol <, "less than."

Composition of RoboStar Mixtures

	RoboStar CS	RoboStar SS
Argon	>85%	>60%
Carbon Dioxide	<10%	<1%
Helium	---	<40%
Oxygen	<5%	---

4. First Aid Measures

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

SKIN CONTACT: Wash with soap and water. If irritation persists, seek medical attention.

SWALLOWING: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

EYE CONTACT: Flush with water. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Get medical attention if discomfort persists.

NOTES TO PHYSICIAN: *There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

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5. Fire Fighting Measures

FLAMMABLE PROPERTIES: These mixtures cannot catch fire.

SUITABLE EXTINGUISHING MEDIA: Use media appropriate for surrounding fire. Water (i.e., safety shower) is the preferred extinguishing media for clothing fires.

PRODUCTS OF COMBUSTION: Not applicable.

PROTECTION OF FIREFIGHTERS: CAUTION! High-pressure 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. Shut off leak 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.

Specific Physical and Chemical Hazards. Heat of fire can build pressure in cylinder and cause it to rupture. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). Cylinders containing this mixture are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.)

Protective Equipment and Precautions for Firefighters. Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

CAUTION! High-pressure gas.

Personal Precautions. These mixtures are asphyxiants. Lack of oxygen can kill. Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Shut off leak if you can do so without risk. Ventilate area or move cylinder to a well-ventilated area. Test for sufficient oxygen, especially in confined spaces, before allowing reentry.

Environmental Precautions. 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 HANDLING: *Can cause rapid suffocation due to oxygen deficiency.* Close cylinder valve after each use; keep closed even when empty. ***Protect cylinders from damage.*** Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. 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. ***Keep away from heat, sparks, and open flame.*** Use only spark-proof tools and explosion-proof equipment. ***Arcs and sparks can ignite combustible materials.*** Prevent fires. For more information on fire prevention in welding and cutting, see NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hotwork*, published by the National Fire Protection Association. ***Do not strike an arc on the cylinder.*** The defect produced by an arc burn could lead to cylinder rupture.

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PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation. 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. For other precautions in using these mixtures, see section 16.

RECOMMENDED PUBLICATIONS: For further information on storage, handling, and use, see Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

8. Exposure Controls/Personal Protection

See section 16 for important information on by-products generated during use in welding and cutting.

COMPONENT	OSHA PEL	ACGIH TLV-TWA (2005)
Argon	Not established.	Simple asphyxiant
Carbon Dioxide	5000 ppm	5000 ppm; 30,000 ppm, 15 min STEL
Helium	Not established.	Simple asphyxiant
Oxygen	Not established.	Not established.

TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

IDLH = Not available.

ENGINEERING CONTROLS:

Local Exhaust. Use a local exhaust system, if necessary, to prevent oxygen deficiency and to keep hazardous fumes and gases in the worker's breathing zone below all applicable exposure limits.

Mechanical (General). General exhaust ventilation may be acceptable if it can maintain an adequate supply of air and keep hazardous fumes and gases in the worker's breathing zone below all applicable exposure limits.

Special. None

Other. None

PERSONAL PROTECTIVE EQUIPMENT:

Skin Protection. Wear work gloves for cylinder handling; welding gloves for welding and cutting.

Eye/Face Protection. Wear safety glasses when handling cylinders. For welding, see section 16.

Respiratory Protection. 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 limits for fumes, gases, and other by-products of welding with RoboStar mixtures. See sections 3, 10, 15, and 16 for details. An air-supplied respirator must be used in confined spaces. Respiratory protection must conform to OSHA 29 CFR 1910.134. Select per OSHA 29 CFR 1910.134 and ANSI Z88.2.

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9. Physical and Chemical Properties

APPEARANCE:	Colorless gas
ODOR:	Unknown. The carbon dioxide component is felt by some to have a slightly pungent odor and taste.
ODOR THRESHOLD:	Not available.
PHYSICAL STATE:	Gas at normal temperature and pressure
pH:	Not applicable.
MELTING POINT at 1 atm:	Not available.
BOILING POINT at 1 atm:	Not available.
FLASH POINT (test method):	Not applicable.
EVAPORATION RATE (Butyl Acetate = 1):	Gas
FLAMMABILITY:	Nonflammable
FLAMMABLE LIMITS IN AIR, % by volume:	LOWER: Not applicable. UPPER: Not applicable.
VAPOR PRESSURE:	Not applicable.
VAPOR DENSITY:	Not applicable.
SPECIFIC GRAVITY (H₂O = 1):	Gas, not applicable.
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	0.88-1.38 (approximate range, calculated)
SOLUBILITY IN WATER 32°F (0°C):	Negligible
PARTITION COEFFICIENT: n-octanol/water:	Not available.
AUTOIGNITION TEMPERATURE:	Not applicable.
DECOMPOSITION TEMPERATURE:	Not available.
PERCENT VOLATILES BY VOLUME:	Gas
MOLECULAR WEIGHT:	Not applicable.
MOLECULAR FORMULA:	Mixtures of Ar, CO ₂ , & He or O ₂

10. Stability and Reactivity

CHEMICAL STABILITY: Unstable Stable

CONDITIONS TO AVOID: None known.

INCOMPATIBLE MATERIALS: Alkali metals, alkaline earth metals, metal acetylides, chromium, titanium above 1022°F (550°C), uranium above 1382°F (750°C), magnesium above 1427°F (775°C).

HAZARDOUS DECOMPOSITION PRODUCTS: The arc may form gaseous reaction products such as carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by the radiation from the arc. See section 16. Other decomposition products of normal operation originate from the volatilization, reaction, or oxidation of the material being worked.

POSSIBILITY OF HAZARDOUS REACTIONS: May Occur Will Not Occur

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11. Toxicological Information

ACUTE DOSE EFFECTS: Not available. The welding process may generate hazardous fumes and gases. (See sections 3, 10, 15, and 16.)

ACUTE INHALATION EFFECTS: Argon, carbon dioxide, and helium are asphyxiants. Carbon dioxide is physiologically active. It initially stimulates respiration and then causes respiratory depression. High concentrations result in narcosis. Symptoms in humans are as follows:

<u>EFFECT:</u>	<u>CONCENTRATION:</u>
Breathing rate increases slightly.	1%
Breathing rate increases to 50% above normal level. Prolonged exposure can cause headache, tiredness.	2%
Breathing increases to twice normal rate and becomes labored. Weak narcotic effect. Impaired hearing, headache, increased blood pressure and pulse rate.	3%
Breathing increases to approximately four times normal rate, symptoms of intoxication become evident, and slight choking may be felt.	4 - 5%
Characteristic sharp odor noticeable. Very labored breathing, headache, visual impairment, and ringing in the ears. Judgment may be impaired, followed within minutes by loss of consciousness.	5 - 10%
Unconsciousness occurs more rapidly above 10% level. Prolonged exposure to high concentrations may eventually result in death from asphyxiation.	10 - 100%

12. Ecological Information

ECOTOXICITY: No known effects.

OTHER ADVERSE EFFECTS: None known. These mixtures do not contain any Class I or Class II ozone-depleting chemicals.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

DOT/IMO SHIPPING NAME: Compressed gases, n.o.s. (argon, carbon dioxide, helium or oxygen)

HAZARD CLASS: 2.2	PACKING GROUP/Zone: Not applicable.	IDENTIFICATION NUMBER: UN1956	PRODUCT RQ: None
SHIPPING LABEL(s): NONFLAMMABLE GAS			
PLACARD (when required): NONFLAMMABLE GAS			

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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)].

MARINE POLLUTANTS: None of the components of this mixture is listed as a marine pollutant by DOT.

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 (EHS) (40 CFR Part 355):

TPQ: None

EHS RQ (40 CFR 355): None

SECTIONS 311/312: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: Yes

DELAYED: No

PRESSURE: Yes

REACTIVITY: No

FIRE: No

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

None of the components of these mixtures is subject to 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, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

None of the components of these mixtures is listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: The components of these mixtures are listed on the TSCA inventory.

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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.

None of the components of these mixtures is listed in Appendix A as a highly hazardous chemical.

STATE REGULATIONS:

CALIFORNIA: None of the components of these mixtures is listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: The components of these mixtures are 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.

ADDITIONAL SAFETY AND HEALTH HAZARDS: Using this product in welding and cutting may create additional hazards:

Read and understand the manufacturer's instructions and the precautionary labels on the products used in welding and cutting. For other safe practices information and a more-detailed description of the health hazards of welding and their consequences, ask your welding products supplier for a copy of Praxair's free safety booklet, P-52-529, *Precautions and Safe Practices for Electric Welding and Cutting*, and for other manufacturers' safety publications. For a detailed treatment, get ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, published by the American Welding Society (AWS), 550 N.W. Le Jeune Rd., Miami, FL 33126, <http://www.aws.org/>, or see OSHA's Web site at <http://www.osha-slc.gov/SLTC/weldingcuttingbrazing/>. Order AWS documents from Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5710, <http://global.ihs.com/>.

FUMES AND GASES can be dangerous to your health and may cause serious lung disease.

- **Keep your head out of fumes. Do not breathe fumes and gases. Use enough ventilation, local exhaust, or both to keep fumes and gases from your breathing zone and the general area. Short-term overexposure to fumes may cause dizziness, nausea, and dryness or irritation of the nose, throat, and eyes or may cause other similar discomfort.**

Fumes and gases cannot be classified simply. The amount and type depend on the metal being worked and the process, procedure, equipment, and supplies used. Possible dangerous materials may be found in fluxes, electrodes, and other materials. Get an MSDS for every material you use.

Contaminants in the air may add to the hazard of fumes and gases. One such contaminant, chlorinated hydrocarbon vapors from cleaning and degreasing activities, poses a special risk.

- **Do not use electric arcs in the presence of chlorinated hydrocarbon vapors—highly toxic phosgene may be produced.**

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Metal coatings such as paint, plating, or galvanizing may generate harmful fumes when heated. Residues from cleaning materials may also be harmful.

- **Avoid arc operations on parts with phosphate residues (anti-rust, cleaning preparations)—highly toxic phosphine may be produced.**

To find the quantity and content of fumes and gases, you can take air samples. By analyzing these samples, you can find out what respiratory protection you need. One recommended sampling method is to take air from inside the worker's helmet or from the worker's breathing zone. See AWS F1.1, *Methods for Sampling and Analyzing Gases for Welding and Allied Processes*, available from the American Welding Society, 550 N.W. Le Jeune Rd., Miami, FL 33126.

NOTES TO PHYSICIAN:

Acute: *Gases, fumes, and dusts may cause irritation to the eyes, lungs, nose, and throat. Some toxic gases associated with welding and related processes may cause pulmonary edema, asphyxiation, and death. Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty breathing, frequent coughing, or chest pains.*

Chronic: *Protracted inhalation of air contaminants may lead to their accumulation in the lungs, a condition that may be seen as dense areas on chest x-rays. The severity of change is proportional to the length of exposure. The changes seen are not necessarily associated with symptoms or signs of reduced lung function or disease. In addition, the changes on x-rays may be caused by non-work-related factors such as smoking, etc.*

PROTECTIVE CLOTHING AND EQUIPMENT FOR WELDING OPERATIONS:

PROTECTIVE GLOVES: Wear welding gloves.

EYE PROTECTION: Wear a helmet or use a face shield with a filter lens. Select lens per ANSI Z49.1. Provide protective screens and flash goggles if needed to protect others; select per OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Wear hand, head, and body protection. (See ANSI Z49.1.) Worn as needed, these help prevent injury from radiation, sparks, and electrical shock. Minimum protection includes welder's gloves and a face shield. For added protection, consider arm protectors, aprons, hats, shoulder protection, and dark, substantial clothing.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: **High-pressure gas.** Use piping and equipment adequately designed to withstand pressures to be encountered. Use a backflow prevention device in any piping. **In choosing tools and equipment, avoid materials incompatible with acetylene.** Copper, silver, and mercury and their salts, compounds, and high-concentration alloys can form explosive compounds with acetylene. Brass containing less than 65% copper and certain nickel alloys are generally acceptable for use in acetylene service but may not be adequate if high corrosion or excess moisture is present. **Can cause rapid suffocation due to oxygen deficiency.** Store and use with adequate ventilation. Close cylinder valve after each use; keep closed even when empty. **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 place a compressed gas cylinder where it may become part of an electrical circuit.** When using compressed gases in and around electric welding applications, never ground the cylinders. Grounding exposes the cylinders to damage by the electric welding arc.

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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 = 1
FLAMMABILITY = 0
INSTABILITY = 0
SPECIAL = None

HMIS RATINGS:

HEALTH = 1
FLAMMABILITY = 0
PHYSICAL HAZARD = 3

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: CGA-580
PIN-INDEXED YOKE: Not applicable.
ULTRA-HIGH-INTEGRITY CONNECTION: Not applicable.

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlet V-1 listed below. Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information can be found in the following materials published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, <http://www.cganet.com/Publication.asp>.

AV-1 *Safe Handling and Storage of Compressed Gases*
G-6 *Carbon Dioxide*
P-1 *Safe Handling of Compressed Gases in Containers*
P-9 *Inert Gases—Argon, Nitrogen, and Helium*
SB-2 *Oxygen-Deficient Atmospheres*
V-1 *Compressed Gas Cylinder Valve Inlet and Outlet Connections*
V-7 *Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures*
— *Handbook of Compressed Gases, Fourth Edition*

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Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

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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.

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