

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Compressed gases, flammable, n.o.s. (hydrogen, argon) (MSDS No. P-4861-E)	Trade Names: HydroStar® H-5, H-10, H-35 Shielding Gases (This product is intended for electric welding use.), Hydrogen-Argon Mixtures
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Chemical Name: Mixtures of hydrogen and argon

Synonyms: Not applicable.

Chemical Family: Not applicable.

Product Grades: None assigned.

Telephone: **Emergencies:** 1-800-645-4633*

Company Name: Praxair, Inc.

CHEMTREC: 1-800-424-9300*

39 Old Ridgebury Road

Routine: 1-800-PRAXAIR

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. Hazards Identification

EMERGENCY OVERVIEW

DANGER! Flammable, high-pressure gas mixtures.

Can form explosive mixtures with air.

May ignite if valve is opened to air.

Burns with invisible flame.

Can cause rapid suffocation.

May cause dizziness and drowsiness.

Self-contained breathing apparatus may be required by rescue workers.

Under ambient conditions, this product is a colorless, odorless gas.

OSHA REGULATORY STATUS: The components of this mixture are considered hazardous by the OSHA Hazard Communications Standard (29 CFR 1910.1200).

POTENTIAL HEALTH EFFECTS:

Effects of a Single (Acute) Overexposure

Inhalation. Asphyxiant. Effects are due to lack of oxygen. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconsciousness. Lack of oxygen can kill.

Skin Contact. No harm expected.

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

Eye Contact. No harm expected.

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

Other Effects of Overexposure. These mixtures are asphyxiants. Lack of oxygen can kill.

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: Neither component 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 section 16 for important information about mixtures.

COMPONENT	CAS NUMBER	CONCENTRATION
Hydrogen	1333-74-0	3% to >99%*
Argon	7440-37-1	<1% to 97%*

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

4. First Aid Measures

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

SKIN CONTACT: Flush with water. Seek medical attention if discomfort persists.

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

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

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. Refer to section 16.*

5. Fire Fighting Measures

FLAMMABLE PROPERTIES: Flammable gas mixtures

SUITABLE EXTINGUISHING MEDIA: CO₂, dry chemical, water spray, or fog.

PRODUCTS OF COMBUSTION: Water (H₂O)

PROTECTION OF FIREFIGHTERS: DANGER! Flammable, high-pressure gas mixtures.

Asphyxiant. Effects are due to lack of oxygen. Evacuate all personnel from danger area. Immediately spray cylinders with water from maximum distance until cool, taking care not to extinguish flames. Remove all cylinders from fire area if without risk; continue cooling water spray while moving cylinders. Do not extinguish any flames emitted from cylinders; stop flow of gas if without risk, or allow flames to burn out. 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. Flammable gas. Flame is nearly invisible.

Escaping gas may ignite spontaneously. Hydrogen has a low ignition energy. Fireball forms if gas cloud ignites immediately after release.

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Forms explosive mixtures with air and oxidizing agents. Heat of fire can build pressure in cylinder and cause it to rupture. No part of a cylinder should be subjected to a temperature higher than 125°F (52°C). Cylinders containing these mixtures are equipped with pressure relief devices. (Exceptions may exist where authorized by DOT.) If venting or leaking hydrogen catches fire, do not extinguish flames. Flammable gas may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an appropriate device.

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:

DANGER! Flammable, high-pressure gas mixtures.

Personal Precautions. Forms explosive mixtures with air. (See section 5.) Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if without risk. Reduce vapors with fog or fine water spray. Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Flammable gas may spread from leak. Before entering area, especially confined areas, check atmosphere with an appropriate device.

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: *May cause anesthetic effects. Protect cylinders from damage.* Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. *Hydrogen is the lightest known gas.* It may leak out of systems that are air-tight for other gases and may collect in poorly ventilated upper reaches of buildings. *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.* The defect caused by an arc burn may lead to cylinder rupture. *Do not crack hydrogen cylinder valves before opening them; escaping gas may ignite spontaneously.* Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. *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. For other precautions in using these mixtures, see section 16.

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation. Separate hydrogen cylinders from oxygen, chlorine, and other oxidizers by at least 20 ft (6.1 m), or use a barricade of noncombustible material. This barricade should be at least 5 ft (1.53 m) 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

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hand. **Post “No Smoking or Open Flames” signs in storage and use areas.** There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. 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.

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. For full details and requirements for hydrogen see NFPA 50A, *Standard for Gaseous Hydrogen Systems at Consumer Sites*, published by the National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101; 1-800-344-3555; www.nfpa.org.

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 (2006)
Hydrogen	Not established.	Not established.
Argon	Not established.	Simple asphyxiant.

Hazardous fumes may be generated during welding with this product. See section 16 for more information on welding hazards.

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 an explosion-proof local exhaust system, if necessary, to prevent oxygen deficiency and keep hazardous fumes and gases below all applicable exposure limits in the worker’s breathing zone.

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

Special. None

Other. None

PERSONAL PROTECTIVE EQUIPMENT:

Skin Protection. Wear work gloves for cylinder handling. As needed, wear hand, head, and body protection, which help to 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. For more information, see section 16. Regardless of protective equipment, never touch live electrical parts.

Eye/Face Protection. Wear safety glasses when handling cylinders. Select as per OSHA 29 CFR 1910.133. 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 all applicable exposure limits for fumes, gases, and other by-products of

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welding. See sections 3, 10, and 16 for details. An air-supplied respirator must be used in confined spaces. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134. Select per OSHA 29 CFR 1910.134 and ANSI Z88.2.

9. Physical and Chemical Properties

APPEARANCE:	Colorless gas
ODOR:	None
ODOR THRESHOLD:	Not applicable.
PHYSICAL STATE:	Gas at normal temperature and pressure
pH:	Not applicable.
FREEZING POINT at 1 atm:	Not available.
BOILING POINT at 1 atm:	Not available.
FLASH POINT:	Flammable gas mixture
EVAPORATION RATE (Butyl Acetate = 1):	High
FLAMMABILITY:	Flammable
FLAMMABLE LIMITS IN AIR , % by volume:	LOWER: H-5, unknown; H-10-H-35, 40%-11.4% UPPER: 75% (all)
VAPOR PRESSURE at 70°F (21.1°C):	Not available.
GAS DENSITY:	Not available.
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	0.0695-1.34 (calculated)
SOLUBILITY IN WATER 68°F (20°C):	Negligible
PARTITION COEFFICIENT: n-octanol/water:	Not available.
AUTOIGNITION TEMPERATURE:	Not available.
DECOMPOSITION TEMPERATURE:	Not available.
PERCENT VOLATILES BY VOLUME:	100
MOLECULAR WEIGHT:	Not applicable.
MOLECULAR FORMULA:	Mixtures of H ₂ & Ar

10. Stability and Reactivity

CHEMICAL STABILITY: Unstable Stable

CONDITIONS TO AVOID: Heat, sparks, flame. The presence of incompatible materials.

INCOMPATIBLE MATERIALS: Oxygen, chlorine, and other oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS: The arc process may give off such gases as carbon monoxide and carbon dioxide. Arc radiation may form ozone and nitrogen oxides. Other decomposition products of arc welding and cutting form when the material being worked vaporizes or reacts with other materials including oxygen, i.e., oxidizes. See section 16.

POSSIBILITY OF HAZARDOUS REACTIONS: May Occur Will Not Occur

These mixtures contain hydrogen and may explode in the presence of oxidizers.

11. Toxicological Information

ACUTE DOSE EFFECTS: None known. The welding process may generate hazardous fumes and gases. (See sections 8, 10, 15, and 16.)

STUDY RESULTS: None known.

12. Ecological Information

ECOTOXICITY: No adverse ecological effects expected.

OTHER ADVERSE EFFECTS: 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.

Emergency Disposal.

CAUTION: Any disposal must be conducted in accordance with federal, state, and local regulations.

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

14. Transport Information

DOT/IMO SHIPPING NAME: Compressed gases, flammable, n.o.s. (hydrogen, argon)

HAZARD CLASS:	PACKING GROUP/Zone:	IDENTIFICATION NUMBER:	PRODUCT RQ:
2.1	NA*	UN1954	None

SHIPPING LABEL(s): FLAMMABLE GAS

PLACARD (when required): FLAMMABLE GAS

*NA = Not Applicable

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: Neither component of these mixtures 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.

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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: 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.

Neither component of these mixtures requires 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.

The hydrogen component is listed as a regulated substance in quantities of 10,000 lb
(4,536 kg) or greater.

TSCA: TOXIC SUBSTANCES CONTROL ACT: The components of these mixtures are
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.

Neither component of these mixtures is listed in Appendix A as a highly hazardous
chemical. However, any process that involves a flammable gas on site in one
location in quantities of 10,000 lb (4536 kg) or greater is covered under this
regulation unless the gas is used as a fuel.

STATE REGULATIONS:

CALIFORNIA: Neither component of these mixtures is listed by California under the SAFE
DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: Propylene 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.

ADDITIONAL SAFETY AND HEALTH HAZARDS: Using these mixtures 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. Ask your welding products supplier for a copy of Praxair's free safety booklet, P-2035, *Precautions and Safe Practices for Gas Welding, Cutting, and Heating*, 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.**

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 AWS.

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.*

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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: **Flammable, high-pressure gas mixtures.** Use piping and equipment adequately designed to withstand pressures to be encountered. All piped hydrogen systems and associated equipment must be grounded. Electrical equipment must be non-sparking or explosion-proof. Leak check system with soapy water; never use a flame. **Arcs and sparks can ignite combustible materials.** Prevent fires. For more information, get NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hotwork*, published by the National Fire Protection Association. **Prevent reverse flow.** Use a backflow prevention device in any piping. **Never work on a pressurized system.** If there is a leak, close the cylinder valve. Blow the system down in an environmentally safe 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.

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 = 4
INSTABILITY = 0
SPECIAL = None

HMIS RATINGS:

HEALTH = 0
FLAMMABILITY = 4
PHYSICAL HAZARD = 3

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	0-3000 psig	CGA-350
PIN-INDEXED YOKE:	0-3000 psig	Not applicable.
ULTRA-HIGH-INTEGRITY CONNECTION:	0-3000 psig	Not applicable.

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 and V-7 listed below.

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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	<i>Safe Handling and Storage of Compressed Gases</i>
G-5	<i>Hydrogen</i>
P-1	<i>Safe Handling of Compressed Gases in Containers</i>
P-9	<i>The Inert Gases—Argon, Nitrogen, and Helium</i>
SB-2	<i>Oxygen-Deficient Atmospheres</i>
V-1	<i>Compressed Gas Cylinder Valve Inlet and Outlet Connections</i>
V-7	<i>Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures</i>
—	<i>Handbook of Compressed Gases, Fourth Edition</i>

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.

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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