

TITLE : THEMIS Instrument Purge Plan

DOC # :THM-SYS-032

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	THEMIS PURGE OUTLINE						
	DESCRIPTION	WHERE	RESPONSIBI E	PURGE	GAS SOURCE	GAS SUPPLIED BY	REMARKS
1	INSTRUMENTS ON BENCH	UCB	UCB	CONSTANT EXCEPT WHEN IMPRACTICAL (MAX 24 HRS OFF PURGE)	K BOTTLE MEETING PRAXAIR SPEC NI5.0UH OR LN2 DEWAR WITH EQUIV PURITY	UCB	
2	INSTRUMENT SUITE INTEGRATION	UCB	UCB	CONSTANT EXCEPT WHEN IMPRACTICAL (MAX 24 HRS OFF PURGE) OR DURING TVAC TESTING	K BOTTLE MEETING PRAXAIR SPEC NI5.0UH OR LN2 DEWAR WITH EQUIV PURITY	UCB	
3	SUITE TVAC	UCB	UCB	NO PURGE	N/A	UCB	
4	PROBE INTEGRATION	UCB	UCB	CONSTANT EXCEPT WHEN IMPRACTICAL (MAX 24 HRS OFF PURGE)	K BOTTLE MEETING PRAXAIR SPEC NI5.0UH OR LN2 DEWAR WITH EQUIV PURITY	UCB	
5	TRANSPORT TO JPL	TRUCK	UCB	CONSTANT EXCEPT WHEN IMPRACTICAL (MAX 24 HRS OFF PURGE)	MANIFOLDED K BOTTLES: PRAXAIR NI5.0UH IN TRUCK	UCB	
6	JPL VIBE/MAG/EMC TESTING	JPL	UCB	CONSTANT EXCEPT WHEN IMPRACTICAL (MAX 24 HRS OFF PURGE)	K BOTTLE MEETING PRAXAIR SPEC NI5.0UH OR LN2 DEWAR WITH EQUIV PURITY	JPL	
7	JPL TVAC	JPL	UCB	NO PURGE 24HR MAX	N/A	N/A	
8	JPL SPIN BALANCE	JPL	UCB	NO PURGE 24HR MAX	N/A	N/A	
9	TRANSPORT TO AstroTech	TRUCK	UCB	CONSTANT EXCEPT WHEN IMPRACTICAL (MAX 24 HRS OFF PURGE)	MANIFOLDED K BOTTLES: PRAXAIR NI5.0UH IN TRUCK	UCB	
10	PROBE AND PCA INTEGRATION ACTIVITIES	AstroTec h	UCB	CONSTANT EXCEPT WHEN IMPRACTICAL (MAX 24 HRS OFF PURGE)	K BOTTLE MEETING PRAXAIR SPEC NI5.0UH OR LN2 DEWAR WITH EQUIV PURITY	AstroTech	
11	PROBE FUELING	FUELING CONTRA CTOR	UCB	NO PURGE 24HR MAX	N/A	N/A	
12	PCA BAGGING (ENCAPSULATION)	AstroTec h	UCB	NO PURGE 24HR MAX	K BOTTLE MEETING PRAXAIR SPEC NI5.0UH OR LN2 DEWAR WITH EQUIV PURITY	AstroTech	
13	POST ENCAPSULATION PURGE OF THE BAG	AstroTec h	UCB	PURGE BAG FOR 24 HRS	K BOTTLE MEETING PRAXAIR SPEC NI5.0UH OR LN2 DEWAR WITH EQUIV PURITY	AstroTech	
14	TRANSPORT TO PAD	KSC	UCB	NO PURGE EXCEPT RESIDUAL NI IN PCA BAG	N/A	N/A	
15	LIFT TO L.V.	KSC	UCB	NO PURGE EXCEPT RESIDUAL NI IN PCA BAG	N/A	N/A	
16	SHROUD INSTALLATION	KSC	UCB	REMOVE PURGE BAG	N/A	N/A	

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POLICY / PROCEDURE



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1.0 Overview

This document is intended to provide the purge requirements for the THEMIS spacecraft from instrument assembly through launch site operations.

Two of the instruments on the THEMIS probes require high purity (99.999%) nitrogen purging – the SST (Solid State Telescope) and ESA (Electrostatic Analyzer) instruments. The detectors in these are sensitive to condensable hydrocarbons, particulates, and in the case of the ESA microchannel plates, water vapor. Purge pressure is 5 psi and flow rate is less than 16.7 cc/min per instrument. Total flow rate for two SST's, one EESA and one IESA is 66.8 cc/min. Total flow for 5 probes is 334 cc/min or 0.118 cfm.

Purge System – Flow Rates					
System	System Flow	System Flow	System Flow Rate		
Pressure	Rate (per	Rate (per Probe)	(per 5 Probes)		
(Regulated)	Instrument)				
5 psi	16.7 cc/min	66.8 cc/min	334 cc/min		
	5.89 X10-4 cfm	2.35 X 10-3 cfm	1.18 X 10-2 cfm		

Table 2

2.0 Purge Requirements

The SSTs and ESAs shall be constantly purged after detectors are installed, except that these instruments may be off purge during any continuous maximum 24 hour period as necessary when required for unpacking, installation onto the probes, and during tests where purging is impractical (vibration, TVAC, spin balance, etc). Purge is required during shipment between UCB and JPL and between JPL and AstroTech. Purge shall otherwise be maintained as outlined here up to the points denoted below for each instrument type. Reference Table 2.

2.1 SSTs – purge per 1.1 until probe to PCA integration. Purge covers shall be left on at all times whether purge is underway or not, unless removal is required (vibration, TV, spin balance, etc). Lumalloy caps shall be installed over the collimators any time the purge covers are removed from the instrument. Lumalloy caps shall be removed for the last time during red tag removal/green tag installation prior to Probe to PCA Integration. Reference THM-SST-ICD-001 for "Red Tag" and "Green Tag" items.

2.2 ESAs – purge per 1.1 until Probe to PCA Integration. ESA shall be bagged whenever purge is off and dust covers are removed. Aperture dust cover to be left on whenever possible. Purge and dust cover removed for final time at Probe to PCA Integration. Reference THM-IDP-ICD-001 for "Red Tag" and "Green Tag" items.

3.0 Hardware Responsibility

UCB SSL will supply all purge system hardware. All hardware shall be cleaned and maintained per Cleaning Procedure THM-ESA-PRC-004 REV A.

4.0 Nitrogen Supply Requirements

Only LN2 dewar (GP160 type or equiv) boil-off or UCB approved GN2 shall be used for purging unless approved by UCB. One approved GN2 is Praxair NI 5.5VC. LN2 dewar nitrogen must meet the purity specifications of Praxair NI 5.0 UH.

4.1 UCB will arrange to provide LN2 dewars or GN2 per section 4.0 during operations at UCB.

4.2 JPL will arrange to provide LN2 dewars or GN2 per section 4.0 during operations at JPL.

4.3 AstroTech will arrange to provide LN2 dewars or GN2 per section 4.0 during operations at AstroTech.

5.0 Monitoring Responsibility

UCB is responsible for purging the instruments. JPL and AstroTech will provide assistance in monitoring the gas supply level, but the setup and monitoring responsibilities remain with UCB.

6.0 Monitoring Hardware

A two stage regulator reduces pressure from bottle pressure to 5 psig. Flow regulation is built into each instrument using a sintered metal flow orifice. Flow is 16.7 cc/min at 5 psig for each instrument. A flow meter allows verification of flow. A 10 psig relief valve is provided for overpressure relief. An oxygen sensor is provided to ensure safety. All Gages have blowout protection. Relief valves are tested at a pressure of 10 psi. Regulator handles are modified to prevent unauthorized or inadvertent adjustment.

7.0 Safety

7.1 Danger!

This system uses nitrogen gas. A suffocation danger exists.

7.2 Mitigation

7.2.1 Very small volumes of gas are used (334 cc/min / 0.0118 cfm for all instruments on all probes).

7.2.2 UCB/SSL will supply a tested and certified oxygen sensor whenever the purge system is used.

7.2.3 Ventilation will be used in enclosed spaces to prevent the buildup of a dangerous level.

Reference: Nitrogen Gas MSDS Appendix 1.

8.0 Applicable Standards

The purge system was designed to comply with the following standards:

NASA-STD-5005	Ground Support Equipment Design Criteria
EWR 127	Eastern and Western Range Safety Policies and Practices
PAIP	THEMIS Performance Assurance Implementation Plan, (UCB Document)
THM-SYS-011	THEMIS Configuration Management Plan, (UCB Document)
THM-SYS-004	THEMIS Contamination Control Document, (UCB Document)
SAI-PLAN- 0647	THEMIS Mission System Safety Program Plan, (Swales Document)

9.0 Purge Apparatus

Figure 1 shows the general probe purge arrangement, Figure 2 shows the purge hardware, Figures 3 and 4 show the instrument purge connections, Figure 5 shows Purge Bagging for PCA. Reference drawing THM-ESA-MEC-990, Purge System, for more hardware information.

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Figure 1 Purge System – Probe Mounted On Cart At UCB OR JPL

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Figure 2 Purge Hardware

Ref Drawing: THM-ESA-MEC-990 REV B PURGE ASSEMBLY

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Figure 3 **ESA Purge Connections**

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Figure 4 SST Purge Connections

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Figure 5 PCA Purge Bag (Schematic)

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification					
Product Name: Nitrogen, compressed (MSDS No. P-4631-F)			Trade Name: Nitrogen		
Chemical Name: Nitrogen			Synonyms: Dinitrogen		
Formula: N ₂			Chemical Family:	Permanent gas	
Telephone: Emergencies: 1-800-645-4633* CHEMTREC: 1-800-424-9300* Routine: 1-800-PRAXAIR * Call emergency numbers 24 hours a day only for spills,			Company Name: leaks, fire, exposure	Praxair, Inc. 39 Old Ridgebury Road Danbury, CT 06810-5113 , or accidents involving this	

^{*} 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

See section 16 for important information about mixtures.

INGREDIENT	CAS NUMBER	CONCEN- TRATION	OSHA PEL	ACGIH TLV-TWA (2001)
Nitrogen	7727-37-9	>99%*	None currently established	Simple asphyxiant
* The symbol > means "greater than"; the symbol <, "less than."				

3. Hazards Identification

EMERGENCY OVERVIEW

CAUTION! High-pressure gas. Can cause rapid suffocation. May cause dizziness and drowsiness. Self-contained breathing apparatus may be required by rescue workers. Odor: None

THRESHOLD LIMIT VALUE: TLV-TWA, simple asphyxiant (ACGIH, 2001). TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

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.

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

OTHER EFFECTS OF OVEREXPOSURE: Asphyxiant. Lack of oxygen can kill.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: The toxicology and the physical and chemical properties of nitrogen suggest that overexposure is unlikely to aggravate existing medical conditions.

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

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

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: Flush with water. If discomfort persists, seek medical attention.

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

EYE CONTACT: Flush eyes thoroughly 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.

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:** Nitrogen cannot catch fire. Use media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES: CAUTION! High-pressure gas. Asphyxiant. Lack of oxygen can kill. 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 flow if you can do so without risk. Self-contained breathing apparatus may be required by rescue workers. (See section 16.) On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION 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). Nitrogen cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.)

HAZARDOUS COMBUSTION PRODUCTS: None known.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: CAUTION! High-pressure gas. Asphyxiant. Lack of oxygen can kill. Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Shut off flow 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.

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. 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 $125^{\circ}F(52^{\circ}C)$. 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. For other precautions in using nitrogen, see section 16.

For additional information on storage and handling, refer to Compressed Gas Association (CGA) pamphlet P-1, *Safe Handling of Compressed Gases in Containers*, available from the CGA. Refer to section 16 for the address and phone number along with a list of other available publications.

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST-Use a local exhaust system, if necessary, to prevent oxygen deficiency.

MECHANICAL (general)–General exhaust ventilation may be acceptable if it can maintain an adequate supply of air.

SPECIAL-None

OTHER–None

RESPIRATORY PROTECTION: None required under normal use. Air-supplied respirators must be used in confined spaces or in an oxygen-deficient atmosphere. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134.

SKIN PROTECTION: Wear work gloves when handling cylinders.

EYE PROTECTION: Wear safety glasses when handling cylinders. Select in accordance with OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Proper	rties
MOLECULAR WEIGHT:	28.01
SPECIFIC GRAVITY (air = 1) at 70°F (21.1°C) and 1 atm:	0.967
GAS DENSITY at 70°F (21.1°C) and 1 atm:	0.072 lb/ft ³ (1.153 kg/m ³)
SOLUBILITY IN WATER, vol/vol at 32°F (0°C) and 1 atm:	0.023
PERCENT VOLATILES BY VOLUME:	100
BOILING POINT at 1 atm:	-320.44°F (-195.80°C)
MELTING POINT at 1 atm:	-345.8°F (-209.9°C)

APPEARANCE, ODOR, AND STATE: Colorless, odorless, tasteless gas at normal temperature and pressure.

10. Stability and Reactivity				
STABILITY:	Unstable	Stable		
INCOMPATIBILITY (materials to avoid): None known.				
HAZARDOUS DECOMPOSITION PRODUCTS	: None known.			
HAZARDOUS POLYMERIZATION: May Occur Will Not Occur				
CONDITIONS TO AVOID: Under certain conditions, nitrogen can react violently with lithium,				
neodymium, titanium, and magnesium to form nitrides. At high temperature it can also combine with				

oxygen and hydrogen.

11. Toxicological Information

Nitrogen is a simple asphyxiant.

12. Ecological Information

No adverse ecological effects expected. Nitrogen does not contain any Class I or Class II ozone-depleting chemicals. Nitrogen 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, and then slowly discharge gas to the atmosphere.

14. Transport Information

DOT/IMO SHIPPING NAME:		Nitrogen, compressed				
HAZARD		IDENTIFICATION		PRODUCT		
CLASS:	2.2	NUMBER:	UN 1066	RQ:	None	
SHIPPING LABEL(s):		NONFLAMMABLE	GAS			
PLACARD (when required):		NONFLAMMABLE	GAS			

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 (EHS) (40 CFR Part 355):

Threshold Planning Quantity (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: No

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

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

Nitrogen is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Nitrogen 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.

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

STATE REGULATIONS:

CALIFORNIA: Nitrogen is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: Nitrogen 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.

NOTE: The suitability of nitrogen as a component in underwater breathing gas mixtures is to be determined by or under the supervision of personnel experienced in the use of underwater breathing gas mixtures and familiar with the physiological effects, methods employed, frequency and duration of use, hazards, side effects, and precautions to be taken.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: *High-pressure gas.* Use piping and equipment adequately designed to withstand pressures to be encountered. *Gas can cause rapid suffocation due to oxygen deficiency.* Store and use with adequate ventilation. Close 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.*

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:		HMIS RATINGS:	
HEALTH	= 0	HEALTH	= 0
FLAMMABILITY	= 0	FLAMMABILITY	= 0
REACTIVITY	= 0	REACTIVITY	= 0
SPECIAL	= SA (CGA	recommends this to designate	te Simple Asphyxiant.)

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	0-3000 psig 3001-5500 psig	CGA-580 CGA-680
	5001-7500 psig	CGA-677
PIN-INDEXED YOKE:	0-3000 psig	CGA-960 (medical use)
ULTRA-HIGH-INTEGRITY CONNECTION:	0-3000 psig	CGA-718

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 about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700.

AV-1 Safe Handling and Storage of Compressed Gases	
G-10.1 Commodity Specification for Nitrogen	
P-1 Safe Handling of Compressed Gases in Containers	
P-9 Inert Gases – Argon, Nitrogen, and Helium	
P-14 Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmos	pheres
SB-2 Oxygen-Deficient Atmospheres	
V-1 Compressed Gas Cylinder Valve Inlet and Outlet Connections	,
— Handbook of Compressed Gases, Third Edition	

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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