Aceti-Oxigeno, S.A.
FABRICANTES DE GASES PARA USO MÉDICO, ALIMENTICIO E INDUSTRIALES

MATERIAL SAFETY DATA SHEET

(MSDS MATERIAL SAFETY DATA SHEET)

GASEOUS AND LIQUID HELIUM

Annex 10

1. Product and company identification

1.2	Common chemical name:	Helium
1.3	IUPAC chemical name:	Helium
1.4	Chemical family:	Family of noble gases
1.5	Condensed formula:	He
1.6	Synonyms:	Synonyms: USP Helium, Gaseous Helium, Liquid Helium, Cryogenic Liquid Helium, Refrigerated Liquid Helium
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:	Industrial, analytical, and as liquid in magneto cooling for NMR

2. Composition or information on ingredients

2.1	Ingredient name:	Helium
2.2	CAS [1] Number:	7440-59-7
2.3	Percentage:	> 99%
2.4	OSHA PEL-TWA [2]:	None
2.5	ACGIH TLV [3]:	Simple asphyxiant
2.6	[LD_{50}]:	None
2.7	[LC_{50}]:	None

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[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 gas
3.1.2 Can quickly cause suffocation
3.1.3 Do not breathe the gas
3.1.4 Rescue workers must require self-contained breathing apparatus.

3.2 Information on potential health effects

3.2.1 Exposure routes

3.2.1.1 Inhalation: Simple asphyxiant. Helium 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.

3.2.1.2 **Warning:** The practice of intentionally inhaling helium for the purpose of altering the timbre of the voice is extremely dangerous, and can cause brain damage and death.

3.2.1.3 Contact with eyes: No risk

3.2.1.4 Skin contact: No risk

3.2.1.5 Skin absorption: No risk

3.2.1.6 Ingestion: No risk

3.2.2 Chronic effects: No chronic effects have been established from its use.

3.2.3 Medical conditions aggravated by overexposure: None

3.2.4 Other effects of overexposure: None

3.2.5 Carcinogenicity: Helium 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 there is no breathing, administer artificial respiration. If breathing is difficult, administer oxygen. Get immediate medical attention.

4.2 Contact with eyes: Eye contact: No first aid required.

4.3 Skin contact: No first aid required.

4.4 Ingestion: No first aid required

4,5 Notes to the doctor: None

5. Measures in case of fire

5.1 Ignition point: Not applicable because it is a gas.

5.2 Auto ignition: Non-flammable

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: Helium is non-flammable and does not stimulate combustion. Use appropriate extinguishing media for the surrounding flammable materials.

5.5 Special instructions to firefighters: Helium is a simple asphyxiant. If possible, remove helium cylinders from the fire area and cool them with water. Rescue workers may require self-contained breathing apparatus.

5.6 Unusual fire and explosion hazards: On exposure to intense heat or flame, cylinders will rapidly vent *and/or rupture violently. Most cylinders are designed to vent their contents* when exposed to 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 known.

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 personnel from the affected area

6.1.2 Disconnect the helium source if there is no additional risk in doing so

6.1.3 Ventilate the area or move cylinders outside the facility

6.1.4 Increase the rate of vaporization by spraying large amounts of water on the spill from a downwind position.

6.1.5 If a leak is observed or detected in the container or its valve, contact Aceti-Oxígeno, S.A.

7. Handling and storage

7.1 *Precautions for storage*

7.1.1 Store and use with adequate ventilation.

7.1.2 Cylinders must be stored upright with the valve protection cap in place, properly secured to prevent them from falling or being hit.

7.1.3 Protect cylinders from any physical damage. Do not drag, roll, slide or drop them.

7.1.4 Do not allow storage temperature to exceed 125ºF (52ºC).

7.1.5 Full and empty cylinders must be separated.

7.1.6 Use a FIFO (first-in, first-out) inventory system to prevent full cylinders from being stored for long periods of time.

7.2 Precautions to be taken in handling

7.2.1 Use a handcart to move cylinders.

7.2.2 Never attempt to lift a cylinder by means of the valve protection plug.

7.2.3 If there is any difficulty in the operation of the valve, discontinue its use and contact Aceti-Oxígeno, S.A.

7.2.4 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 generate helium leaks.

7.2.5 Do not hit the valve protection cap with a hammer. Use an adjustable strap wrench to remove rusted or overtightened plugs.

7.2.6 Never bring an electric arc near a compressed gas cylinder or make it part of an electrical circuit.

7.2.7 For additional precautions in the use of helium, see Section 16. Other Information.

8. Exposure control and personal protection

8.1 Infrastructure Controls

8.1.1 Ventilation: Provide adequate natural ventilation or mechanical ventilation to prevent the appearance of oxygen-deficient atmospheres that contain less than 19.5% oxygen.

8.2 Respiratory Protection

8.2.1 General routine use: Not required

8.2.2 Emergency Use: Self-contained breathing apparatus or positive pressure airline with face mask is required for use in oxygen-deficient atmospheres. Air-purifying respirator systems will not provide any protection.

8.3 Protective Gloves: It is recommended to wear work gloves when handling cylinders.

8.4 Eye protection: The use of safety glasses is recommended for handling the cylinders.

The undersigned, Authorized Public Translator, certifies that this document is a translation of its original written in Spanish.
Panama, July 28, 2022.

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DE 4 DE DICIEMBRE 1989.
PANAMÁ, REP. DE PANAMÁ

8.5 Other Protective Equipment: Safety footwear is recommended when handling cylinders. It is advisable to wear cotton clothing to prevent the accumulation of static electricity.

9. Physical and chemical properties

9.1 Molecular Weight: 4.0026 g/mol

9.2 Boiling point (1 atmosphere): -452.1°F (-268.9°C)

9.3 Specific Gravity (Air = 1) at 70°F (21.1°C) and 1 atmospheric pressure: 0.135

9.4 *Melting point (1 atmosphere)*: No known solid phase

9.5 Vapor pressure at 70°F (21.1°C): Not applicable

9.6 Gas density at 70°F (21.1°C) and 1 atmospheric pressure: 0.0103 lb/cf or 0.165 Kg/m^3

9.7 Evaporation rate (Butyl Acetate = 1): Not applicable because it is a gas.

9.8 Solubility in water:
9.8.1 Vol/Vol at 32°F (0°C) and 1 atmospheric pressure: 0.0094

9.9 Expansion Ratio: Not applicable

9.10 pH: Not applicable

9.11 Appearance, odor and condition: Colorless, odorless and tasteless gas at normal temperature and pressure.

9.12 Water/oil distribution coefficient: Not available

9.13 Odor threshold: Not applicable

10. Stability and reactivity

10.1 Stability: Stable

10.2 Conditions to avoid: None

10.3 Incompatibilities (materials to avoid): None

10.4 Reactivity:
10.4.1 Hazardous decomposition products: None
10.4.2 Hazardous polymerization products: Will not occur.

11. Toxicological information

11.1 General toxicological effect: Simple asphyxiant

11.2 Ability to cause irritation: None

11.3 Sensitization to material: None

11.4 Effects on the reproductive system: None

11.5 Teratogenicity: None

11.6 Mutagenicity: None

11.7 Synergistic Materials: None

12. Ecological information

No adverse or negative ecological impacts are expected. Helium does not contain Class I or Class II chemicals, which deplete the ozone layer (40 CFR [6] Part 82). Helium is not listed as a marine pollutant by DOT [7] (49 CFR Part 171).

[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: Compressed Helium.

14.2 Hazard classification: 2.2 (Non-flammable Gas)

14.3 Identification number: UN 1046

14.4 Product identification number: 1046

14.5 Product reportable quantity: Not applicable

14.6 Shipping labels: Non-flammable 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

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

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

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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. Helium is not listed as a regulated substance.

15.1.3 TSCA Toxic Substance Control Act: Helium 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. Helium is not listed in Appendix A as a high-risk chemical.

15.3 FDA (Food and Drug Administration)

15.3.1 21 CFR 184.1355: Generally recognized as safe (GRCS) as a direct human food ingredient when used as a processing aid. Helium USP (United Stated Pharmacopea) is regulated by the FDA as a prescription drug.

16. Additional information

16.1 Special precautions: Use piping and equipment properly designed to withstand working pressures. Use a check valve or other cylinder or piping protection device to prevent and avoid reverse flow.

Shipping compressed gas cylinders that have not been filled with the consent of the cylinder owner is a violation of US federal law [49CFR 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 Other data:

16.3.1 NFPA Valuation (National Fire Protection Association)

Health	0
Flammability	0
Instability	0
Special	Simple Asphyxiant (CGA recommended designation)

16.3.2 HMIS Valuation (Hazardous Materials Identification Systems)

Health	0
Flammability	0
Reactivity	0

Classification of the chemical substance according to the SGA:

GAS

Physical hazards: Gases under pressure, Compressed gas.
Health Hazards: N/A.
Environmental Hazards: N/A

Elements for the communication and signalization of hazards:

Word of warning: Attention.
Hazard statements:
H280: Contains gas under pressure; may explode if heated

Precautionary advice:
Prevention: N/A
Answer: N/A
Storage:
P410+P403: Protect from sunlight. Store in a well-ventilated place.
Elimination: N/A.

Other Hazards: May act as a simple asphyxiant, diluting the concentration of oxygen in the air to levels below those necessary to support life. Inhalation of helium in excessive concentrations can cause dizziness, nausea, vomiting, loss of consciousness and death. Containers may explode when heated. Ruptured cylinders can be projected.

Liquid

Physical Hazards:
Pressurized gases, refrigerated liquefied gas.
Health Hazards: N/A.
Environmental Hazards: N/A.

Elements for the communication and signalization of hazards:

Word of warning: Attention.
Hazard statements:
H281: Contains refrigerated gas; may cause cryogenic burns or injuries.
Precautionary advice:
Prevention:
P282: Wear cold-insulating gloves and eye/face protection.
Response:
P315: Seek immediate medical assistance
P336: Thaw frozen parts with lukewarm water. Do not rub the affected part.
Storage:
P403: Store in a well-ventilated place.
Elimination: N/A.

Other dangers:

Extremely cold liquid and gas under pressure.

Direct contact with liquid can cause frostbite.
It can act as a simple asphyxiant, diluting the concentration of oxygen in the air to levels below those necessary to support life. Inhalation of helium in excessive concentrations can cause: dizziness, nausea, vomiting, loss of consciousness and death. The use of a self-contained breathing apparatus may be necessary. Ruptured cylinders may de projected.

Pictogram/ Hazard Symbol:

Transp. Gas

Transp. Líquido

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16.4 Standard valve connection for the United States and Canada

16.4.1 Coiled: Standard CGA 580 for cylinders at pressures between 0 and 3000 psig. CGA 680 standard for cylinders with pressures between 3001 and 5500 psig. CGA 677 standard for cylinders with pressures between 5501 and 7500. For Panama the standard is CGA 580.

16.4.2 Indexed Pin Yoke: CGA 930 (for medical use) at pressures between 0 and 3000 psig.

16.4.3 Ultra High Integrity: Standard 718 for cylinders with pressures between 0 and 3000 psig.

Use the proper CGA connection. DO NOT USE ADAPTERS.

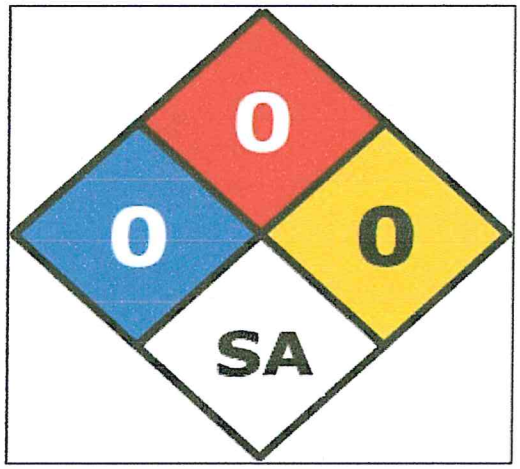
More detailed information on helium can be found in the following documents published by the Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Phone (703) 412-0900:

G-9.1	Commodity Specifications for Helium
P-9	Inert Gases - Argon, Nitrogen, Helium
P-14	Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmospheres
SB-2	Oxygen Deficient Atmospheres
AV-1	Safe Handling and Storage of Compressed Gases

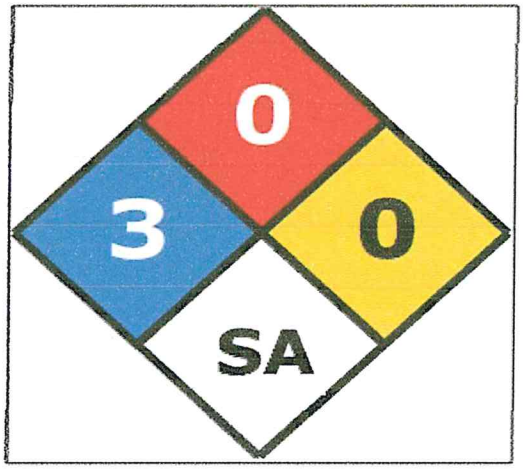
Conversion Table

HELIUM (He) 4.0026 g/mol PE=-268.9 °C						
UNITS	WEIGHT		GAS VOLUME		LIQUID VOLUME	
	Pounds	Kilograms	SCF Gas	Nm³ Gas	Liquid gallons	Liquid liters
Pounds	1.000	0.454	96.710	2.542	0.959	3.631
Kilograms	2.205	1.000	213.200	5.603	2.115	8.006
SCF Gas	0.010	0.005	1.000	0.026	0.010	0.038
Nm³ Gas	0.394	0.178	38.040	1.000	0.378	1.429
Liquid gallons	1.042	0.473	100.800	2.649	1.000	3.785
Liquid liters	0.275	0.125	26.630	0.700	0.264	1.000

Gaseous Helium



Liquid Helium



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Panama, July 28, 2022.

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COMPATIBILITY WITH OTHER MATERIALS

Metals	
Bronze	Satisfactory
303 Stainless Steel	Satisfactory
316 Stainless Steel	Satisfactory
Aluminum	Satisfactory
Zinc	Satisfactory
Copper	Satisfactory
Monel-metal	Satisfactory
Plastics	
PCTFE	Satisfactory
Teflon	Satisfactory
Tefzel	Satisfactory
Kynar	Satisfactory
PVC	Satisfactory
Polycarbonate	Satisfactory
Elastomers	
Kalrez	Satisfactory
Viton	Satisfactory
Buna-N	Satisfactory
Neoprene	Satisfactory
Polyurethane	Satisfactory

Metals	
Bronze	Satisfactory
304 Stainless Steel	Satisfactory (same as 304L and 304LN)
316 Stainless Steel	Satisfactory (same as 316L, 321)
Aluminum	Satisfactory (with Cu, Zn, Mn, Si)
Zinc	Satisfactory
Copper	Satisfactory
Monel-metal	Satisfactory
Plastics	
PCTFE	Unsatisfactory
Teflon	Satisfactory
Tefzel	No information available
Kynar	No information available
PVC	Unsatisfactory
Polycarbonate	Unsatisfactory
Elastomers	
Kalrez	Unsatisfactory
Viton	Unsatisfactory
Buna-N	Unsatisfactory
Neoprene	Unsatisfactory
Polyurethane	Unsatisfactory

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.