Material Safety Data Sheet

Flammable Gas Mixture: Argon / Carbon Dioxide / Carbon Monoxide / Hydrogen / Nitrogen

Section 1. Chemical product and company identification

Product name : Flammable Gas Mixture: Argon / Carbon Dioxide / Carbon Monoxide / Hydrogen / Nitrogen

Supplier : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Product use : Synthetic/Analytical chemistry.

MSDS # : 007526

Date of Preparation/ Revision : **1/3/2015.**

In case of emergency : 1-866-734-3438

Section 2. Hazards identification

Physical state : Gas.

Emergency overview : DANGER!

FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
HARMFUL IF INHALED.
MAY CAUSE RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.

Keep away from heat, sparks and flame. Do not puncture or incinerate container. Avoid breathing gas. Avoid contact with eyes, skin and clothing. Contains material that may cause target organ damage, based on animal data. Use only with adequate ventilation. Wash thoroughly after handling. Keep container closed. Avoid breathing gas. Use with adequate ventilation.

Contact with rapidly expanding gases can cause frostbite.

Target organs : Contains material which may cause damage to the following organs: blood, lungs, the nervous system, heart, cardiovascular system, central nervous system (CNS).

Routes of entry : Inhalation Dermal Eyes

Potential acute health effects

Eyes : Moderately irritating to eyes. Contact with rapidly expanding gas may cause burns or frostbite.

Skin : Moderately irritating to the skin. Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : Toxic by inhalation. Moderately irritating to the respiratory system.

Ingestion : Ingestion is not a normal route of exposure for gases

Potential chronic health effects

Chronic effects : Contains material that may cause target organ damage, based on animal data.

Target organs : Contains material which may cause damage to the following organs: blood, lungs, the nervous system, heart, cardiovascular system, central nervous system (CNS).

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

Flammable Gas Mixture: Argon / Carbon Dioxide / Carbon Monoxide / Hydrogen / Nitrogen

See toxicological information (Section 11)

Section 3. Composition, Information on Ingredients

Name	CAS number	% Volume	Exposure limits
Hydrogen	1333-74-0	8.4 - 99	Oxygen Depletion [Asphyxiant]
Nitrogen	7727-37-9	1 - 92	Oxygen Depletion [Asphyxiant]
Argon	7440-37-1	0.1 - 92	Oxygen Depletion [Asphyxiant]
Carbon Monoxide	630-08-0	0.0001 - 50	**ACGIH TLV (United States, 3/2012).** TWA: 29 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **NIOSH REL (United States, 1/2013).** CEIL: 229 mg/m³ CEIL: 200 ppm TWA: 40 mg/m³ 10 hours. TWA: 35 ppm 10 hours. **OSHA PEL (United States, 6/2010).** TWA: 55 mg/m³ 8 hours. TWA: 50 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** CEIL: 229 mg/m³ CEIL: 200 ppm TWA: 40 mg/m³ 8 hours. TWA: 35 ppm 8 hours.
Carbon Dioxide	124-38-9	0.0001 - 20	**ACGIH TLV (United States, 3/2012).** **Oxygen Depletion [Asphyxiant].** STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 9000 mg/m³ 8 hours. TWA: 5000 ppm 8 hours. **NIOSH REL (United States, 1/2013).** STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 9000 mg/m³ 10 hours. TWA: 5000 ppm 10 hours. **OSHA PEL (United States, 6/2010).** TWA: 9000 mg/m³ 8 hours. TWA: 5000 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 18000 mg/m³ 8 hours. TWA: 10000 ppm 8 hours.

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training.If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus.It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

Flammability of the product : Flammable.

Auto-ignition temperature : Lowest known value: 500 to 571°C (932 to 1059.8°F) (hydrogen).

Flammable limits : Greatest known range: Lower: 4% Upper: 76% (hydrogen)

Products of combustion : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides

Fire-fighting media and instructions : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Extremely flammable. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Gas may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back, causing fire or explosion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Handling : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Avoid contact with skin and clothing. Use with adequate ventilation. Avoid contact with eyes. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Storage : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Personal protection in case of a large spill : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Full chemical-resistant suit and self-contained breathing apparatus should be worn only by trained and authorized persons.

Product name

hydrogen	Oxygen Depletion [Asphyxiant]
nitrogen	Oxygen Depletion [Asphyxiant]
argon	Oxygen Depletion [Asphyxiant]
carbon monoxide	**ACGIH TLV (United States, 3/2012).** TWA: 29 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **NIOSH REL (United States, 1/2013).** CEIL: 229 mg/m³ CEIL: 200 ppm TWA: 40 mg/m³ 10 hours. TWA: 35 ppm 10 hours. **OSHA PEL (United States, 6/2010).** TWA: 55 mg/m³ 8 hours. TWA: 50 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** CEIL: 229 mg/m³ CEIL: 200 ppm TWA: 40 mg/m³ 8 hours. TWA: 35 ppm 8 hours.
Carbon dioxide	**ACGIH TLV (United States, 3/2012). Oxygen Depletion [Asphyxiant].** STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 9000 mg/m³ 8 hours. TWA: 5000 ppm 8 hours.

NIOSH REL (United States, 1/2013).
STEL: 54000 mg/m³ 15 minutes.
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OSHA PEL (United States, 6/2010).
TWA: 9000 mg/m³ 8 hours.
TWA: 5000 ppm 8 hours.
OSHA PEL 1989 (United States, 3/1989).
STEL: 54000 mg/m³ 15 minutes.
STEL: 30000 ppm 15 minutes.
TWA: 18000 mg/m³ 8 hours.
TWA: 10000 ppm 8 hours.

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Melting/freezing point : -189.2°C (-308.6°F) This is based on data for the following ingredient: argon. Weighted average: -219.11°C (-362.4°F)

Critical temperature : Lowest known value: -240.15°C (-400.3°F) (hydrogen).

Vapor density : Highest known value: 1.66 (Air = 1) (argon). Weighted average: 0.93 (Air = 1)

Gas Density (lb/ft ^{3}) : Weighted average: 0.02

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.

Incompatibility with various substances : Highly reactive with oxidizing agents.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
carbon monoxide	TDLo Intraperitoneal	Rat	35 mL/kg	-
	LC50 Inhalation Gas.	Rat	6600 ppm	30 minutes
	LC50 Inhalation Gas.	Rat	3760 ppm	1 hours
Carbon dioxide	LC50 Inhalation Gas.	Rat	470000 ppm	30 minutes

Chronic effects on humans : Contains material which may cause damage to the following organs: blood, lungs, the nervous system, heart, cardiovascular system, central nervous system (CNS).

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Products of degradation : Products of degradation: carbon oxides (CO, CO_2) and water, nitrogen oxides (NO, NO_2 etc.).

Environmental fate : Not available.

Environmental hazards : No known significant effects or critical hazards.

Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1954	COMPRESSED GAS, FLAMMABLE, N.O.S.	2.1	Not applicable (gas).		-
TDG Classification	UN1954	COMPRESSED GAS, FLAMMABLE, N.O.S.	2.1	Not applicable (gas).		**Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden
Mexico Classification	UN1954	COMPRESSED GAS, FLAMMABLE, N.O.S.	2.1	Not applicable (gas).		-

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

United States

U.S. Federal regulations :

TSCA 8(a) CDR Exempt/Partial exemption: Not determined
United States inventory (TSCA 8b): All components are listed or exempted.

SARA 302/304: No products were found.
SARA 311/312 Hazards identification: Fire hazard, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Air Act (CAA) 112 accidental release prevention - Flammable Substances: Hydrogen

Clean Air Act (CAA) 112 regulated flammable substances: hydrogen

State regulations :

Connecticut Carcinogen Reporting: None of the components are listed.
Connecticut Hazardous Material Survey: None of the components are listed.
Florida substances: None of the components are listed.
Illinois Chemical Safety Act: None of the components are listed.
Illinois Toxic Substances Disclosure to Employee Act: None of the components are listed.
Louisiana Reporting: None of the components are listed.
Louisiana Spill: None of the components are listed.
Massachusetts Spill: None of the components are listed.
Massachusetts Substances: The following components are listed: HYDROGEN; ARGON; NITROGEN; CARBON MONOXIDE; CARBON DIOXIDE
Michigan Critical Material: None of the components are listed.
Minnesota Hazardous Substances: None of the components are listed.
New Jersey Hazardous Substances: The following components are listed: HYDROGEN; ARGON; NITROGEN; CARBON MONOXIDE; CARBON DIOXIDE; CARBONIC ACID GAS
New Jersey Spill: None of the components are listed.
New Jersey Toxic Catastrophe Prevention Act: The following components are listed: carbon monoxide
New York Acutely Hazardous Substances: None of the components are listed.
New York Toxic Chemical Release Reporting: None of the components are listed.
Pennsylvania RTK Hazardous Substances: The following components are listed: HYDROGEN; ARGON; NITROGEN; CARBON MONOXIDE; CARBON DIOXIDE
Rhode Island Hazardous Substances: None of the components are listed.

California Prop. 65 :

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Carbon Monoxide	No.	Yes.	No.	No.

Canada

WHMIS (Canada) :

Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class D-2A: Material causing other toxic effects (Very toxic).

CEPA Toxic substances: The following components are listed: Carbon dioxide
Canadian ARET: None of the components are listed.
Canadian NPRI: The following components are listed: Carbon monoxide
Alberta Designated Substances: None of the components are listed.
Ontario Designated Substances: None of the components are listed.
Quebec Designated Substances: None of the components are listed.

Section 16. Other information

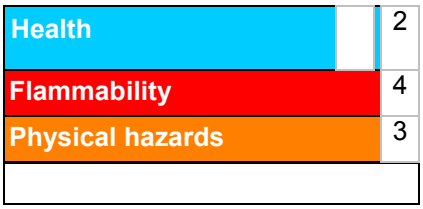
United States

Label requirements : FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
HARMFUL IF INHALED.
MAY CAUSE RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.

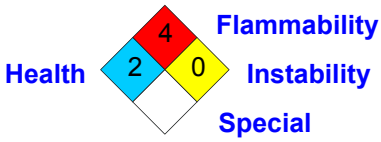
Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class D-2A: Material causing other toxic effects (Very toxic).

Hazardous Material Information System (U.S.A.) :



National Fire Protection Association (U.S.A.) :



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.