Safety Data Sheet

Propane /Autogas

Creation Date: / /

Revision Date: / /

Reference No.:

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1. Identification

1.1. Product Name:

1.2. Product Code:

1.3. Supplier:

Address:

Phone Number:

FAX Number:

Emergency Phone Number:

Attn:

Email Address:

Relevant identified uses: Fuel, chemical feedstock, refrigerant, aerosol propellant

Uses advised against: Comply with applicable laws, regulations and the matters related to the hazard and toxicity information described in this document.

1.4. Manufacturer:

Address:

Phone Number:

FAX Number:

Emergency Phone Number:

Attn:

Email Address:

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2. Hazards Identification

2.1. Classification:

[Physicochemical Hazards]

Flammable Gases:	Category 1
Gases Under Pressure:	Liquefied gas

[Health Hazards]

Specific Target Organ Toxicity (Single Exposure):	Category 2 Circulatory System
	Category 3 Narcotic Effects
Specific Target Organ Toxicity (Repeated Exposure):	Category 2 Central Nervous System

[Environmental Hazards] Not Applicable

2.2. GHS Label Elements:

Pictogram:

Signal Word: Danger

Hazard Statements: Extremely flammable gas

Contains gas under pressure: may explode if heated

Circulatory system disorders

May cause drowsiness or dizziness

Causes damage to the central nervous system damage through prolonged or repeated exposure

2.3. Precautionary Statements

2.3.1– Prevention: Keep away from heat, sparks, open flames and hot surfaces. No Smoking.

Use only outdoors or in a well-ventilated area.

Avoid breathing gas/spray.

2.3.2– Response: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

Eliminate all ignition sources if safe to do so.

Get medical advice~~/attention~~ if you feel unwell.

If inhaled, remove the victim to fresh air and keep at rest in a position comfortable for breathing.

2.3.3 – Storage: Protect from sunlight.

Store in a well-ventilated place. Keep containers tightly closed.

Store in a location that is inaccessible to outsiders.

2.4. Precautionary Statements – Disposal:

Return used containers to the distributor as soon as possible.

2.5. National / Regional Information:

High-pressure gas as defined in Article 2 of the High Pressure Gas Safety Act and is a flammable gas.

Liquefied petroleum gas as defined in Article 2 of the Act on the Securing of Safety and the Optimization of Transactions of Liquefied Petroleum Gas and is a flammable gas.

Flammable gas as defined in item 5 specified in Table 1 of the Order for Enforcement of Industrial Safety and Health Act.

3. Composition/Information on Ingredients

Classification of Chemical Substances and Mixtures: Mixture

Chemical name	Concentration or concentration range (Weight %)	MITI No.	CAS No.
Propane	90% to less than 100%	(2)-3	74-98-6
n-Butane Isobutane	0% to less than 10%	(2)-4	106-97-8 75-28-5
Ethane Ethylene	Less than 3.4% (Note)	(2)-2 (2)-12	74-84-0 74-85-1
Propylene	Less than 10% (Note)	(2)-13	115-07-1
Methanol	Less than 0.24%	(2)-201	67-56-1

(Note) Concentration in Propane

4. First Aid Measures

Inhalation: In case of massive inhalation, measures for oxygen deprivation should be taken. If necessary, seek medical attention.

Skin Contact: Treat for frostbite.

Eye Contact: Rinse thoroughly with clean water.

Ingestion: Same as in case of inhalation or skin contact.

Most Important Symptoms and Effects, both Acute and Delayed:

Frostbite occurs when liquid gas adheres to the skin.

Inhalation of high concentrations of gas causes loss of consciousness in a single breath. If this condition persists, it can be fatal.

Protection of First-aiders: In areas where the product is leaking or gushing, wear protective equipment to prevent skin contact.

Ventilate the area well where the product is leaking or gushing, as the oxygen concentration in the air may be low.

Ventilate the area well when the concentration of leaked gas is about 1.8 to 9.5% of the air, because there is a risk of explosion in the presence of an ignition source.

In the outdoors, use spray nozzles or other means to sprinkle water and prevent explosions.

Special Precautions for Physicians:

No information available

5. Firefighting Measures

Suitable Extinguishing Media: Carbon dioxide, ABC or BC type powder extinguisher is recommended in case of small fires.

Sprinkling and spraying water is recommended in case of large fires.

Unsuitable Extinguishing Media: Straight stream

Specific Hazards Arising from the Chemical:

Highly flammable/highly combustible gas

The product may ignite easily.

Heating may cause the container to explode.

Specific Extinguishing Methods:

Cut off the gas supply. Cool the surrounding area by spraying water with nozzles or other means to prevent the spread of fire.

Spray water from upwind to cool the container while extinguishing the surrounding fire.

In case of a perimeter fire, move the container to a safe location.

Leaked gas should be diffused by water spray or other means to prevent explosion.

If gas leakage can be prevented, extinguish with fire extinguishing agent.

If gas leakage cannot be prevented, do not extinguish the fire and allow fire to burn.

Evacuate all unrelated persons to a safe place.

Protective Equipment and Precautions for Firefighters:

Use air respirators and protective clothing when extinguishing fires.

6. Accidental Release Measures

Personal Precautions, Protective Equipment, and Emergency Procedures:

The product will explode if there is an ignition source within the concentration range of about 1.8% to 9.5% in the air, so stay away from it if safety cannot be confirmed.

Ventilate well to prevent asphyxiation hazards because the volume increases about 250 times, while the oxygen concentration in the air is reduced when vaporized.

When liquefied gas comes in direct contact with the body, the heat of vaporization causes frostbite. Wear dry leather gloves if necessary.

Wear antistatic clothing and shoes, leather gloves. Use air respirators and protective clothing as necessary.

Environmental Precautions: No information available.

Methods and Material for Containment and Cleaning Up:

Stop the leakage if it is not dangerous to do so. If possible, rotate the leaking vessel so that gas, not liquid, is released to the air.

Sprinkle water to reduce evaporation and prevent vapor diffusion.

Ground all equipment when handling spills.

Measures to Prevent Secondary Accidents:

Remove ignition sources in the vicinity. Cut off gas supply.

Stop the leak at the leakage point.

Since the product is heavier than air in specific gravity, there is a risk of accumulation. Measures such as ventilation and diffusion should be taken.

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7. Handling and Storage

7.1. Handling:

Technical Measures: Take measures to prevent containers from tipping over or falling.

Do not handle them roughly.

Always use a pressure regulator, not directly from the container, except in special cases of use.

Use soapy water or other foaming solution to check for leaks at joints, hoses, piping, and equipment.

Local Exhaust and General Ventilation:

Adequate air supply and exhaust shall be provided to prevent incomplete combustion.

Precautions for Safe Handling:

Take measures when using the product in areas where there is a risk of accumulation.

The product mixes with air or oxygen easily to form an explosive gas mixture.

Be very careful about leaks because of high hazard due to its low lower explosive limit (i.e. approximately 1.8% to 9.5%).

Since the product is highly flammable, any use of fire in the vicinity is strictly prohibited.

Containers with removable protective caps should be kept closed when not in use.

Do not use up the gas in the container to the end in order to preserve residual pressure.

Contact Avoidance: See "10. Stability and reactivity”.

7.2. Storage:

Conditions for Safe Storage: Containers should be placed in a dry area with good drainage and ventilation.

Keep containers out of direct sunlight and at temperatures 40°C (104°F) or lower.

Store in a location that is inaccessible to outsiders.

Post warning signs clearly indicating "flammable gas" or "LP Gas" when storing containers in a container yard.

Containers filled with toxic gases and oxygen should be kept in separate.

Container storage area is provided.

No fire or flammable or combustible materials shall be placed within a radius of

2-meters around the container storage area when a container storage area is provided, except when necessary barriers are provided.
Promptly return used containers to the distributor.

Safe Container Material: The container shall be a liquefied petroleum gas container as defined in the High Pressure Gas Safety Act.

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8. Exposure Controls/Personal Protection

8.1. Exposure Guidelines:

Japan Society for Occupational Health:

(2024) *n*-Butane 500 ppm (Note 1)
Isobutane 500 ppm (Note 1)
Methanol 200 ppm (Note 1)

~~ACGIH: *n*-Butane 1,000 ppm (Note 2)~~
~~(TLV-TWA, 2016) Isobutane 1,000 ppm (Note 2)~~
~~Ethylene 200 ppm (Note 3)~~
~~Propylene 500 ppm (Note 3)~~
~~Methanol 200 ppm (Note 1)~~

(Note 1) The average daily exposure concentration must not exceed this value.
~~(Note 2) The average exposure concentration over any 15-minute period must not exceed this value. (STEL: short-term exposure limit)~~
~~(Note 3) The average daily exposure concentration must not exceed this value. (TWA: time-weighted average)~~
~~The sum of the product of the exposure concentration and its duration divided by the total number of hours.~~

8.2. Appropriate Engineering Controls:

Engineering Measures: Ensure to ventilate well when used indoors.
In areas where liquefied petroleum gas is likely to leak and accumulate, install gas leak alarms that will sound an alarm when the gas concentration in the air is less than about 0.5% (about 1/4 of the lower explosive limit).

8.3. Individual Protection Measures:

Respiratory Protection: Use an air respirator as necessary.
Hand Protection: Wear dry leather gloves as necessary.
Eye Protection: Wear protective eyewear as necessary.
Skin and Body Protection: Wear work clothes and helmets appropriate for the type of use.

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9. Physical and Chemical Properties

Physical State: Gaseous under atmospheric pressure. In the pressure vessel, liquid.
Color: Colorless, transparent
Odor: Odorless, but usually odorized so that 1/1000 leakage into the air can be detectable

except for industrial odorless gas use.

Melting point: See the attached table.

Boiling point See the attached table.

Flammability: Flammable gas

Lower and upper explosive (flammable) limits: See the attached table.

Flash point: See the attached table.

Auto ignition temperature: See the attached table.

Decomposition temperature: not available

pH: Not applicable (gaseous at atmospheric pressure)

Decomposition Temperature: No data available.

pH: Not applicable (gaseous at atmospheric pressure)

Kinematic Viscosity: Not applicable (gaseous at atmospheric pressure)

Vapor pressure: See the attached table.

Density: See the attached table.

Relative density (gas): See the attached table.

Particle Properties: Not Applicable (gaseous at atmospheric pressure)

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10. Stability and Reactivity

Reactivity and Chemical Stability:

Stable under normal conditions

Possibility of Hazardous Reactions:

Reacts violently with oxidizing substances

Propane: Explodes violently with chlorine dioxide

Butane: Nickel carbonyl + oxygen gas mixture causes explosion

Conditions to Avoid: Avoid all possible sources of ignition (spark or flame). Do not expose the container to heat.

Materials to Avoid: It is soluble in alcohol and ether and dissolves well in petroleum, animal and vegetable oils, and natural rubber.

Incompatible Materials: Strong oxidizing agents

Hazardous Decomposition Products:

Incomplete combustion in the form of harmful carbon monoxide occurs, if sufficient air is not supplied during combustion.

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11. Toxicological Information

Acute Toxicity (Oral): "Not Applicable".

Acute Toxicity (Inhalation: Gas):

"Not Applicable".

Skin Corrosion/Irritation: "Not Applicable".

Serious Eye Damage/Eye Irritation:

"Not Applicable".

Respiratory or Skin Sensitization:

"Not Applicable".

Germ-Cell Mutagenicity: "Not Applicable".

Carcinogenicity: "Not Applicable".

Reproductive Toxicity: "Not Applicable".

Specific Target Organ Toxicity (Single Exposure):

Isobutane falls under "Category 1 (circulatory system)" and the concentration of all components are calculated to be "Category 2".

Methanol is classified as "Category 1 (central nervous system, visual organs and systemic toxicity)", but the concentration of all components is calculated to be "Not Classified".

All components (propane, *n*-butane, isobutane, ethane, ethylene, propylene and methanol) fall under "Category 3 (narcotic effect)". When the concentration of all components is calculated, the product is classified as "Category 3 (narcotic effect)".

[Source data]

Excerpt from Workplace Safety Site Model SDS (based on JIS Z7253:2019)

2-Methylpropane (Isobutane)

(1) In three of the four deaths from inhalation of butane gas (unknown quantity), *n*-butane, isobutane (this substance), or a mixture of *n*-butane, this substance, and propane were detected in the blood, brain, and lungs, with total hydrocarbon concentrations being greatest in the brain in all cases. The authors reported that, together with one other case of *n*-butane poisoning, the suspected cause of death in five cases was cardiac rhythm disturbances (DFGOT vol. 20 (2003)).

(2) A 16-year-old boy suffered heart failure after inhaling butane gas. Abnormalities were observed on the electrocardiogram, but the mechanism of induction of heart failure was unknown. The authors reported that in addition to central inhibition, oxygen deprivation, ventricular flutter triggering cardiac arrest, or direct induction of cardiac arrest by butane were involved (DFGOT vol. 20 (2003)).

(3) A 2-year-old girl developed ventricular tachycardia, tonic seizures, and hypokalemia after exposure to this substance and deodorants containing butane and propane. Tachycardia is thought to be caused by deodorant exposure and endogenous epinephrine (Patty (6th, 2012)).

(4) After inhalation exposure of dogs (unanesthetized) to 50,000 ppm of this substance (4-hour equivalent: 7,906 ppm) for 6 minutes, epinephrine-induced arrhythmia due to cardiac sensitization occurred. In addition, there have been

several reports of cardiac sensitizing responses to brief inhalation of this substance in experiments under anesthesia in mice and dogs pretreated with epinephrine (DFGOT vol. 20 (2003)).

(5) The EC_{50} for central inhibition in rats and the EC_{50} for anesthetic effects in dogs due to inhalation exposure to this substance has been reported to be 200,000 ppm and 450,000 ppm, respectively (ACGIH (7th, 2017), DFGOT vol. 20 (2003)).

(6) Based on the solubility of *n*-butane and this substance in olive oil and the partition coefficient between air and olive oil, the estimated concentrations for the onset of anesthetic effects in humans are 17,000 ppm for *n*-butane and 24,000 ppm for this substance (DFGOT vol. 20 (2003)).

Specific Target Organ Toxicity (Repeated Exposure):

n-Butane falls under "Category 1 (central nervous system)" and methanol falls under "Category 1 (central nervous system, visual organs)", but the concentration of all components is calculated to be "Category 2 (central nervous system)".

[Source data]

Excerpt from Workplace Safety Site Model SDS (based on JIS Z7253:2019)

n-butane

(1) A 15-year-old girl who abused butane gas in a lighter replacement can for 4 weeks suffered serious brain damage and neurological complications after hospitalization and treatment. MRI results showed disintegration of gray matter and atrophy of the brain (PATTY (6th, 2012)).

(2) There are multiple reports of hallucinations, auditory hallucinations, and other neurological symptoms developing in young men and women who abused butane gas (PATTY (6th, 2012)).

(3) Euphoria and hallucinations were observed in most of the 12 persons who repeatedly inhaled butane gas (DFGOT vol. 20 (2003)).

Aspiration Hazard: The aspiration hazard regulates the hazards of accidental ingestion and does not cover gaseous gases, including liquefied petroleum gas.

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12. Ecological Information

Hazardous to the Aquatic Environment, Short-Term (Acute):

"Not Applicable" in consideration of the concentration of all components, although ethylene falls under "Category 3".

Hazardous to the Aquatic Environment, Long-Term (Chronic):

"Not Applicable" in consideration of the concentration of all components, although Ethylene falls under "Category 3".

Hazardous to the Ozone Layer:

"Not applicable" because the product does not contain any controlled substances listed in Annexes A through E of the Montreal Protocol.

Ecotoxicity: No information available.

Persistence and Degradability: No information available.

Bioaccumulation: No information available.

Mobility in Soil: No information available.

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13. Disposal Considerations

Information on the safe and environmentally preferred disposal method of chemicals, contaminated containers and packaging, or recycling: Return empty or unwanted containers to the supplier. Disposal will be entrusted to a waste disposal contractor licensed by the prefectural governor.

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14. Transport Information

UN Number: UN1075

Proper Shipping Name: Petroleum Gases, Liquefied

Transport Hazard Class(es): 2.1

Packing group: –

Marine Pollutant: Not Applicable

Maritime Regulation Information:

In accordance with IMO (International Maritime Organization) regulations.

Aviation Regulation Information:

In accordance with ICAO (International Civil Aviation Organization) / IATA (International Air Transport Association) regulations.

Specific safety measures and conditions for transport or means of transport: A container should be secured and keep temperature below 40°C.

When transporting gas on a vehicle, a "High-Pressure Gas" warning sign must be displayed in a conspicuous place on the vehicle, and a fire extinguisher, disaster prevention tools, and a yellow card listing emergency contact information and response procedures must be carried. However, this does not apply to vehicles carrying only filled containers with an internal volume of 25L or less, and the total internal volume of the containers is 50L or less.

Information on Domestic Regulations:

Land Regulation Information: In accordance with the provisions of the High Pressure Gas Safety Act.

Maritime Regulation Information:

In accordance with the provisions of the Ship Safety Act.

Aviation Regulation Information:

In accordance with the provisions of the Civil Aeronautics Act.

15. Regulatory Information

Laws	Applicable Matters
Act on the Assessment of Releases of Specified Chemical Substances in the Environment and the Promotion of Management Improvement	Not applicable
Industrial Safety and Health Act	Dangerous substances and hazardous substances for which the name, etc., must be labeled (Article 57 of the Act)
	Dangerous substances and hazardous substances for which the name, etc., must be notified (Article 57-2 of the Act)
	Substances whose potential for danger or harm, etc. must be assessed (Article 57-3 of the Act)
	Hazardous materials and flammable gases (Appended Table 1 No. 5 of the Order for Enforcement)
Poisonous and Deleterious Substances Control Act	Not applicable
High Pressure Gas Safety Act	High-pressure Gas (Article 2, Item 3 of the Act)
	Flammable Gas (General High Pressure Gas Safety Regulations, Article 2, Item 1)
	Container storage and filling containers, etc. (Liquefied Petroleum Gas Safety Regulations, Article 6, Paragraph 2, Item 7)
	Security Measures and Technical Standards Pertaining to Movement (Liquefied Petroleum Gas Safety Regulations, Articles 47, 48 and 49)
Act on the Securing of Safety and the Optimization of Transaction of Liquefied Petroleum Gas	Liquefied Petroleum Gas (Article 2 of the Act)
Ship Safety Act	Gases under pressure (Article 2 and Article 3 of the Regulations on the Carriage and Storage of Hazardous Materials by Ships, and Appendix 1 of the Hazardous Materials Notification)
Civil Aeronautics Act	Gases under pressure (Civil Aeronautics Act, Article 194, Hazardous Materials Notification, Appendix 1)
Port Regulations Act	Gases under pressure (Ordinance for Enforcement of the act Article 12)

16. Other Information

References:

1. Training Textbook on MSDS Preparation Methods for Mixtures (Chemical Substances) in Compliance with GHS (Revised Edition), Japan Industrial Safety and Health Association
2. Japan Industrial Safety and Health Association, Japan Advanced Information Center of Safety and Health, http://www.jaish.gr.jp/
3. GHS Classification Manual, Version “Feb. 10, 2006 ed.”, Liaison Conference of Ministries and Agencies concerned with GHS
4. International Chemical Safety Card (ICSC) Japanese version, National Institute of Health Sciences (NIHS)
5. Workplace Safety Site, Ministry of Health, Labour and Welfare, Japan. http://anzeninfo.mhlw.go.jp/index.html
6. Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Revision 6 (2015), United Nations (METI translation)
7. JIS Z 7253: 2019 "Methods for communicating hazard information on chemicals based on the GHS - Labels, in-workplace markings and safety data sheets (SDS)", Japanese Standards Association
8. JIS Z 7252: 2019 "Classification methods for chemical substances etc. based on the GHS", Japanese Standards Association
9. GHS Preparation Guidelines for Labelling, display and SDS, Japan Chemical Industry Association, September 2023.

(Appendix) Physical and chemical properties

Chemical name	Propane	*n*-Butane	Isobutane	Ethane	Ethylene	Propylene	Methanol
Melting point/Freezing point	-189.7°C (melting point)	-138°C	-160°C	-183°C (melting point)	-169.2°C	-185°C	-97.8°C
Boiling point, initial boiling point and boiling range	-42°C (boiling point)	-0.5°C	-12°C	-89°C (boiling point)	-104°C	-48°C	65°C
Flash point	-104°C	-60°C (Sealed)	-82.99°C	-130°C	—	-108°C	12°C
Combustion range (Explosion range)	Lower limit 2.1 vol% Upper limit 9.5 vol%	Lower limit 1.8 vol% Upper limit 8.4 vol%	Lower limit 1.8 vol% Upper limit 8.4 vol%	Lower limit 3.0 vol% Upper limit 12.5 vol%	Lower limit 2.7 vol% Upper limit 36.0 vol%	Lower limit 2.4 vol% Upper limit 10.3 vol%	Lower limit 6.0 vol% Upper limit 36.5 vol%
Vapour pressure	840 kPa (20°C)	213.7 kPa (21.1°C)	304 kPa (20°C)	3850 kPa (20°C)	8100 kPa (15°C)	1158 kPa (25°C)	95.2 mmHg (20°C)
Relative vapour density (air = 1)	1.6	2.1	2.01	1.05	0.98	1.49	1.11
Specific gravity of liquid (Density)	0.5853 (-45°C/4°C)	0.5788 (20°C/4°C)	0.6	0.572 (-108.4°C/4°C)	—	0.5139 (20°C/4°C)	0.7915 (20°C/4°C
Solubility	62.4 mg/L (25°C, water)	61 mg/L (20°C, water)	48.9 mg/L (Water)	47 mg/L (20°C, water)	131 mg/L (25°C, water)	200 mg/L (25°C, water)	1.00×10^6 mg/L (Water)
n-octanol /water partition coefficient	log Pow = 2.35	log Pow = 2.89 (Measured value)	log Kow = 2.8	log Pow = 1.81 (Measured value)	log Kow = 1.13 (Measured value)	log Pow = 1.77	log Pow = -0.82 to -0.66
Auto-ignition temperature	450°C	287°C	460°C	472°C	490°C	455°C	464°C
Other Data (Molecular weight)	44.1 (ICSC)	58.1 (ICSC)	58.12	30.1 (ICSC)	28.054	42.08	32.04
CAS No.	74-98-6	106-97-8	75-28-5	74-84-0	74-85-1	115-07-1	67-56-1

(Reference) CAS number also includes the classification of liquefied petroleum gas: 68476-85-7.

(Source: Workplace Safety Site, International Chemical Safety Card (ICSC))