

Safety Data Sheet



1. Identification of the Substance/Mixture and the Supplier


Supplier : National Institute of Advanced Industrial Science and Technology (AIST)
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Identity of : Certified reference material NMIJ CRM 4065-a
 Substance/Mixture : Isobutane
 Recommended Use of : The CRM is intended for use in the calibration of instruments and source
 the Chemical and material of isobutane reference gas mixtures for natural gas analysis. Do
 Restriction on Use not use this reference material for other purposes than testing/research.
 This CRM is a reference material (specified in the Japanese Industrial
 Standard (JIS) Q 0030).

2. Hazards Identification

GHS classification Flammable gases/ : Class 1
 Pyrophoric gases
 Flammable aerosols : Classification not possible
 Oxidizing gases : Not classified
 Gas under pressure : Low pressure liquefied gas
 Self-reactive substances : Classification not possible
 and mixtures
 Substances and mixtures : Classification not possible
 which, in contact with
 water, emit flammable
 gases
 Corrosive to metals : Not applicable
 Acute toxicity (Oral) : Not applicable
 Acute toxicity (Dermal) : Not applicable
 Acute toxicity (Inhalation: : Class 4
 gas)
 Acute toxicity (Inhalation: : Classification not possible
 vapor)
 Acute toxicity (Inhalation: : Classification not possible
 dust/mist)
 Skin corrosivity/irritant : Not classified
 Severe eye damages/eye : Not classified
 irritant

	Respiratory sensitization	: Not applicable
	Skin sensitization	: Not applicable
	Germ-cell mutagenicity	: Not applicable
	Carcinogenicity	: Not applicable
	Reproductive toxicity	: Not applicable
	Specific target organ toxicity/systemic toxicity (Single exposure)	: Class 3 (Anesthetic action)
	Specific target organ toxicity /systemic toxicity (Repeated exposure)	: Not applicable
	Aspiration hazard	: Classification not possible
	Hazardous to the aquatic environment, acute hazard	: Classification not possible
	Hazardous to the aquatic environment, long-term hazard	: Classification not possible
GHS label element	:	
Signal Word	:	Danger
Hazards Statement	:	Extremely flammable gas Gas under pressure: May explode if heated Harmful if inhaled May cause drowsiness and dizziness
Precautionary Statement	:	<p>[Precaution]</p> <p>Keep away from ignition sources such as heat, sparks, open flame and hot surfaces. – No smoking. Use only outdoors or in a well-ventilated area. Do not breathe gas. Wash hands thoroughly after handling. Do not eat, drink or smoke when using this reference material.</p> <p>[Action]</p> <p>Leaking gas fire: Do not extinguish, unless leakage can be stopped safely. Eliminate ignition sources if safe to do so. If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If inhaled: If you feel unwell: Call a doctor/physician. If exposed or if you feel unwell: Call a doctor/physician.</p> <p>[Storage]</p> <p>Protect from sunlight. Store in a well-ventilated place at temperatures not exceeding 40 °C. Close container valve and keep protection cap in place. Store locked up.</p> <p>[Disposal]</p> <p>Return this reference material back to the function in charge given in “1. Identification of the Substance/Mixture and the Supplier” when it becomes no longer necessary to use it or when it becomes beyond its shelf life.</p>

The other hazards than the above do not result in classification or are not classifiable.

3. Composition/Information on Ingredients

Substance or mixture	:	Single substance
Chemical name	:	Isobutane
Synonym	:	2-methylpropane
Chemical formula	:	C ₄ H ₁₀
Molecular weight	:	58.12
CAS number	:	75-28-5
Content	:	99.9 %
Reference Number in Gazetted List in Japan	in	Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : (2)-4
	:	Industrial Safety and Health Act : Listed

4. First-aid Measures

If inhaled	:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist: Call a doctor/physician.
If on skin	:	Rinse cautiously with cool water immediately. Do not rub body parts with cryogenic burns. Wrap with sterile bandage. Do not remove clothing. If symptoms persist: Get medical advice/attention.
If in eyes	:	Rinse cautiously with water for 15 ~20 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If symptoms persist: Call a doctor/physician
If swallowed	:	Rinse mouth with water. Call a doctor/physician
Expected Acute and Delayed Symptom	:	Eye/airway irritation, Central nervous system depressant effects, Narcotic effects, Dizziness, Drowsiness, Headache, Nausea, Cryogenic burn if liquid contacts with skin
Most Critical Characteristic and Symptom	:	May affect cardiovascular system and may cause functional impairment and respiratory failure. May die in case of high concentration.
Protection of First-Aid Responder	:	Wear appropriate personal protective equipment for eyes and skin as necessary.

5. Fire-fighting Measures

Extinguishing Media	:	In case of minor fire: Carbon dioxide, Dry chemical extinguisher In case of major fire: Water spray, Water fog
Unsuitable extinguishing media	:	Direct water jet
Fire-Specific Hazards	:	Extremely flammable gas If involved in fire: May polymerize explosively. Container may explode if heated. In case of fire: May emit irritating or toxic gas.
Specific Fire-Fighting	:	Do not extinguish, unless leakage can be stopped safely.

Method	<p>Do not move container when being exposed to heat.</p> <p>Move containers away from area of fire if this can be done without risk.</p> <p>Eliminate ignition sources if safe to do so</p> <p>Fight fire upwind from a place where gas is not stagnated and take measures to prevent leakage.</p> <p>Fight fire from a reasonable distance.</p> <p>Cool down the surroundings by spraying water in order to prevent temperature increase of surrounding facilities due to radiation heat.</p> <p>Do not spray water directly to gas leaking point or safety device, which may make them frozen.</p> <p>Keep cooling container thoroughly with plenty of water even after extinction.</p>
Protection of Fire-Fighters	<p>: Wear appropriate compressed air open-circuit self-contained breathing apparatus and protective clothing (heat resistant).</p>

6. Accidental Release Measures

Personal Precaution	<p>: Eliminate all ignition sources.</p> <p>Immediately designate restricted leakage area with appropriate distance taken in every direction.</p> <p>Keep out unauthorized people.</p> <p>Before entering a confined area, ventilate the area.</p>
Personal Protective Equipment and Emergency Procedures	<p>: Wear appropriate personal protective equipment including protective mask, eye protection and protective gloves.</p>
Environmental Precautions	<p>: Avoid release to the environment.</p>
Recovery and Neutralization	<p>: Since this reference material is gas, it is difficult to collect it.</p> <p>Provide ventilation while watching for deficiency of oxygen.</p>
Prevention of Secondary Disaster	<p>: Eliminate all ignition sources immediately (No smoking, sparks or flame in surrounding areas).</p> <p>Do not spray water directly to leaked materials or their sources.</p> <p>Prevent leaked materials from entering sewers, drainage systems, basement rooms or confined space.</p> <p>Maintain the restricted area until gas diffuses.</p>

7. Handling and Storage

Handling	
Engineering Precautions	<p>: Take the measures stipulated in “8. Exposure Controls/Personal Protection” and wear personal protective equipment as necessary.</p>
Local and General Ventilation	<p>: Provide local and general ventilation as necessary.</p>
Precautions for Safe Handling	<p>: Avoid use of hot surfaces, sparks and fire in surrounding areas.</p> <p>Handle container cautiously and avoid giving a shock or knocking over.</p> <p>After use, close container valve completely and then put valve guard and protection cap in place.</p> <p>Ignition and explosion risks in case of leakage.</p> <p>Avoid contact, inhalation and swallowing.</p>

	Do not breathe gas.
	If in eyes or mouth: May cause irritation. Take thorough precautions when using this reference material.
	Take thorough precautions against leakage when mounting and dismantling container.
	If inhaled in large amount: Suffocation risk
	Use only outdoors or in a well-ventilated area.
Contact Avoidance Information	: See "10. Stability and Reactivity."
Storage	
Appropriate Storage Conditions	: Keep away from ignition sources such as heat, sparks and open flame. No smoking. Store in a well-ventilated place. Keep away from oxidizer, oxygen, explosives, halogen, compressed air, acids, bases, food chemicals, etc. Protect from direct sunlight, and store away from fire at temperatures not exceeding 40 °C. Keep container tightly closed, and store it in a well-ventilated place. Store locked up.
Incompatible Substances	: See "10. Stability and Reactivity."
Safe Container Packaging Material	: Use container stipulated in the High Pressure Gas Safety Act and the United Nations Recommendations on the Transport of Dangerous Goods.
※ See the Certificate for the details on appropriate storage conditions and instructions for use as a reference material.	

8. Exposure Controls/Personal Protection

Administrative levels

Not established

Occupational exposure limit

- ACGIH TLV-TWA : 250 ppm
- Japan Society for Occupational : 500 ppm、1200 mg/m³

Health Recommended Reference

Value

Engineering Controls

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| Ventilation/Exhaust | : Local ventilation equipment or general ventilation equipment
Keep equipment tightly closed or install local ventilation equipment in order to avoid exposure.
Install cylinder cabinet and leakage detector.
Install facilities to rinse eyes and to wash hands and body in the vicinity of a place handling this reference material as necessary. |
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| Safety Control/Gas Detection | : Measuring equipment, Detecting tube |
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| Storage Precautions | : Strict ban on fire.
Protect from direct sunlight.
Avoid contact with strong oxidizers such as nitrate. |
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Personal Protective Equipment

- Respiratory System : Wear appropriate personal protective equipment for respiratory system.
- Hands : Protective gloves
- Eyes : Wear appropriate eye protection such as safety goggles.
- Skin and Body : Wear appropriate personal protective equipment such as protective clothing and face shield.
Protective shoes, Fire-resistant clothing

Hygiene Measures

Handle this reference material in accordance with the industrial health and safety codes.

9. Physical and Chemical Properties

- Appearance, etc. : Gas
- Color : Colorless
- Odor : Gasoline odor or natural gas odor
- pH : No data
- Melting point : $-159.4\text{ }^{\circ}\text{C}$
- Boiling point : $-11.7\text{ }^{\circ}\text{C}$
- Flashing point : $-56\text{ }^{\circ}\text{C}$ or less
- Explosive range : 1.8 ~ 8.4 %
- Vapor pressure : 2611 mmHg (25 °C)
- Relative vapor density(Air=1) : 2.01
- Specific gravity or bulk specific gravity : 2.407 kg/m³ (Gas), 0.551 g/cm³ (Liquid at 25 °C, 101.3 kPa)
- Solubility : 0.0535 g/L in water, soluble in ethanol and ethyl ether.
- n*-Octanol/water partition coefficient (Log Po/w) : 2.76
- Auto-ignition temperature : 460 °C
- Decomposition temperature : No data

10. Stability and Reactivity

- Stability : Stable under normal condition
- Reactivity : Ignition by hot surface, sparks, naked fire.
- Possibility of hazardous reactions : Reacts vigorously with strong oxidants, and may cause a danger of ignition or explosion.
- Conditions to avoid : High temperature, spark, open flame, contact with incompatible hazardous substances.
- Incompatible materials : Strong oxidizing agent
- Hazardous decomposition products : Combustion may cause generation of carbon monoxide and carbon dioxide.

11. Toxicological information

Acute toxicity

- Acute toxicity(Skin) : Not classified
- Acute toxicity(Oral) : Not classified

Acute Toxicity (Inhalation: Gas)	: Classified as Category 4 since there is one report to support No classification and Category 4 each as shown below: Mice: LC50 value (1 hour): 124000 ppm (4-hour-exposure-equivalent value: 62000 ppm) and 52 mg/L (4-hour-equivalent value: 11000 ppm) (ACGIH (2004))
Acute toxicity (Inhalation, vapor)	: Not classified
Acute toxicity (Inhalation, dust/mist)	: Not classified
Skin corrosivity/ irritation	: No data
Severe damage to eyes/ eye irritation	: Classification not possible due to lack of data
Respiratory sensitization	: No data
Skin sensitization	: No data
Germ cell mutagenicity	: Classification not possible due to lack of data
Carcinogenicity	: No data
Reproductive toxicity	: No data
Specific Target Organ Toxicity/Systemic Toxicity (Single Exposure)	: Classified as Category 2 (Heart), based on the following data: Humans: In inhalation exposure study with eight volunteers participated, no effects were observed (Justification for Proposed Permissible Concentration (1988)). It was reported, however, that this reference material “enhanced calcium sensitivity of heart” (ACGIH (2004) and PATTY 5 th vol.4 (2001)). Dogs: In inhalation exposure study, dogs were exposed to 70000 ppm for five minutes (4-hour exposure-equivalent value: 10083 ppm (within the Guidance value range of Category 2)), and cardiotoxic action of cardiac muscle was observed (DFGOT vol.20 (2003)). Classified as Category 3 (Narcotic effects), based on the following data: In inhalation exposure study using mice, “central nervous system depression” (ACGIH (2004)) and “narcotic effects” (DFGOT vol.20 (2003)) were reported. In inhalation exposure study using dogs, “sensory loss” was reported (ACGIH (2004)). Category 3 () based on these results. Meanwhile it was reported that this reference material was “simple asphyxiant” and may cause tachypnea and tachycardia (PATTY 5 th vol.4 (2001)).
Specific Target Organ Toxicity/Systemic Toxicity (Repeated Exposure)	: Not classifiable It was reported that, in two-week inhalation exposure study with volunteers participated, no significant changes were observed in general (Justification for Proposed Permissible Concentration (1988)). Also in 90-day inhalation exposure study using monkeys, no effects were observed (EMEA/MRL/031 (1995)). The details of these studies are not clear and there are no other study data available.
Aspiration Hazard	: Out of the classification scope: This reference material is gas.

12. Ecological Information

Hazardous to the aquatic environment, short-term (Acute)	: No data
Hazardous to the aquatic environment, long-term (Chronic)	: No data
Ecotoxicity	: No data
Persistence and Degradability	: No data
Bioaccumulation	: No data
Mobility in soil	: No data
Ozone depletion potential	: No data

13. Disposal Considerations

Residual Waste	: Observe the Regulation on Safety of General High Pressure Gas of the High pressure Gas Safety Act when disposing of gas under pressure. Introduce combustion abatement system and incinerate this reference material.
Contaminated Container and Package	: Return this reference material back to the function in charge given in “1. Identification of the Substance/Mixture and the Supplier” when it becomes no longer necessary to use it or when it becomes beyond its shelf life. Container must be disposed of by its owner in accordance with relevant legislation. User of container, therefore, must not dispose of it by his/her discretion.

14. Transport Information

UN Number	: 1969
UN Classification	: Class 2.1 (Gas under pressure)
Material name	: Isobutane
Container grade	: —
ICAO/IATA	: —
Marine pollutant	: Not classified
Precautions	: Observe the provisions of the High Pressure Gas Safety Act. Observe the provisions of the Civil Aeronautics Act. Observe the provisions of the Ship Safety Law. Fix container to avoid movement, knock-over, impact and friction. Keep temperatures of container at 40 °C or below during transportation. During summer, in particular, cover container with sheet so as to prevent temperature rise. Keep away from fire, hot air and direct sunlight.

15. Regulatory Information

- ◇Poisonous and Deleterious Substances Control Act:
- Not applicable

- ◇Industrial Safety and Health Act:
 - Dangerous goods/Flammable gases (Enforcement Order Appendix 1-5)
 - Article 57-2 (Enforcement Order: Article 18-2) Hazardous substance whose name, etc. must be notified (butane : 9-482)
 - ◇High Pressure Gas Safety Act:
 - Liquefied gas (Article 2-3)
 - Flammable gas (General High Pressure Gas Safety Regulation Article 2-1)
 - ◇Air Pollution Control Act:
 - Volatile Organic Compound (Article 2-4) (Notice from the Ministry of the Environment to prefectures)
 - ◇Civil Aeronautical Act:
 - High Pressure Gas (Regulation Article 194 Notification of dangerous goods Appendix No. 1)
 - ◇Ship Safety Law:
 - High Pressure Gas (Regulation Article 3 Notification of dangerous goods Appendix No. 1)
 - ◇Act on Port Regulations:
 - Other dangerous goods / high pressure gas (Article 21-2)
 - ◇Road act:
 - Restriction on the passage of vehicles (Article 19-13 of the Enforcement Order, Public Notice of Japan Highway Ownership and Debt Repayment Organization No. 12, Appended Table 2)
- ◎ **This SDS is originally prepared for the use of the material in Japan, thus the stated laws and regulations are stipulated and carried out in Japan. The use of the material in other countries should be referred to and by application of the relevant laws and regulations of the country in which the material will be used.**
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16. Other Information

Others

The information in this document is not intended to be exhaustive and is based on currently available information and data. The measures given in this document are applicable only to normal handling conditions. When handling this reference material under special conditions etc., it is recommended to take safety measures appropriate to each specific application and context of use. This document is intended to provide information and not intended to guarantee anything in handling this reference material.
