

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1. Product identifier**

<b>Commercial name</b>	R600a
<b>Our code</b>	TR600BB
<b>Chemical description</b>	Isobutane (methylpropane) EU Index No: 601-004-00-0 CE No: 200-857-2 CAS No: 75-28-5 REACH No: 01-2119485395-27 Chemical formula: C <sub>4</sub> H <sub>10</sub>

**1.2. Relevant identified uses of the substance or mixture and uses advised against**

<b>Industrial sector</b>	Refrigeration and Air-conditioning
<b>Relevant identified uses</b>	Refrigerant gas for refrigeration and air-conditioners systems
<b>Application</b>	Industrial and professional

**1.3. Details of the supplier of the safety data sheet**

**MARIEL SRL**  
Via Olubi, 5  
28013 Gattico-Veruno (NO) Italy  
Telephone: +39 0322 838319  
Fax: +39 0322 838813  
E-mail: [laboratorio@mariel.it](mailto:laboratorio@mariel.it)

**1.4. Emergency telephone number**

<b>Mariel Srl</b>	<b>+39 0322 838319</b>	<b>Mon/Fri: 8.30-12.30 / 13.30-17.30</b>
CAV-CNIT Anti-Poison National Information Centre	+39 0382 24444	Hours: 24 h / 24 h

**SECTION 2: Hazards identification****2.1. Classification of the substance or mixture****Classification according to in Regulation (EC) No 1272/2008**

Physical hazards	Flammable Gas	Category 1A	H220
	Liquefied Gas		H280

**2.2. Label elements****Dangerous pictogram****GHS02****GHS04**

Signal word	Danger	
Hazard statements (H)	H220	Extremely flammable gas.
	H280	Contains gas under pressure; may explode if heated.

**Precautionary statements (P)**

Prevention	P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
	P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
	P381	In case of leakage, eliminate all ignition sources.
Response	P403	Store in a well-ventilated place

**2.3 Other hazards**

Material safety data sheet according regulation (EU) 2020/878  
Version 6 – Date: 21<sup>st</sup> November, 2022 (replaces version 5 – 06/2022)

n.a.

### SECTION 3: Composition/information on ingredients

#### 3.1. Substances

Name of the substance	%	EU Index No	EC No	CAS No	REACH No	Classification Regulation (EC) No 1272/2008 (CLP)
Isobutane	> 99.50%	601-004-00-0	200-857-2	75-28-5	01-2119485395-27	Flam. Gas 1, H220 Press. Gas (Liq.), H280

Contains no other components or impurities which will influence the classification of the product.

For more information on hazardous components, see sections 8, 11, 12 and 16.

### SECTION 4: First aid measures



**General information:** If the person is unconscious, place it in the recovery position and get immediately medical attention. Do not give anything to an unconscious person. If breathing is irregular, give oxygen. If breathing stopped, administer artificial respiration. If symptoms persist, call a physician.

#### 4.1. Description of first aid measures

Inhalation	Remove patient from exposure to fresh air. Administer oxygen if necessary. Obtain immediate medical attention.
Skin contact	In case of contact with skin, wash immediately with plenty of water. Remove contaminated clothing. If irritation or blistering occurs, call a physician
Eye contact	Remove contact lenses, if present. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If symptoms persist, call a physician.
Ingestion	Unlikely route of exposure. As this product is a gas, refer to the section "Inhalation". Do not induce vomiting without medical advice. Obtain immediate medical attention.

#### 4.2. Most important symptoms and effects, both acute and delayed

In high concentration it can cause asphyxiation. Symptoms may include loss of mobility and/or consciousness. Victims may not realize asphyxiation. In low concentration may have narcotic effect. Symptoms may include dizziness, headache, nausea, and loss of coordination.

#### 4.3. Indication of any immediate medical attention and special treatment needed

Adrenaline and derivate are contra-indicated. Treat symptomatically.

For more information see section 11.

### SECTION 5: Firefighting measures

#### 5.1. Extinguishing media

Suitable extinguishing media: Water spray, alcohol-resistant foam, dry chemical or CO<sub>2</sub>

Unsuitable extinguishing media: High water jet.

#### 5.2. Special hazards arising from the substance or mixture

Specific hazards	Contents under pressure. On heating: heating will cause a rise in pressure with a risk of bursting. Toxic and corrosive vapours are released. Vapours are heavier than air and can cause rapid suffocation by reducing oxygen available for breathing.
Hazardous combustion	In case of fire, decomposition products may include the following materials: carbonyl fluoride, carbon monoxide and hydrofluoric acid.

#### 5.3 Advice for firefighters

Specific methods	Coordinate fire measure to the surrounding fire. Exposure to flames and heat can cause the container to rupture. From protected position, cool endangered containers with water spray jet. Do not discharge contaminated water into drains. If possible, stop flow of the product. If possible, use water spray to knock down the fumes. Explosive re-ignition may occur, turn off all the other fire. Move containers from fire area if this can be done without risk.
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Protective equipment      Wear protective clothing and protective equipment (self-contained breathing apparatus).  
Avoid contact with eyes and skin. Do not breathe the fumes.

## **SECTION 6: Accidental release measure**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Immediately contact emergency personnel.  
Immediately evacuate personnel to safe areas. Unprotected persons must be kept away.  
Wear personal protective equipment refer to section 8 "Exposure controls/personal protection".  
Remove all sources of ignition. Avoid contact with skin (possible frostbite).  
Ventilate the area/local. In case of insufficient ventilation, wear self-contained breathing apparatus.

### **6.2. Environmental precautions**

Do not allow product to spread into the environment.  
Avoid spillage and prevent possible losses.

### **6.3. Methods and material for containment and cleaning up**

Ventilate / aerate the area or local.

### **6.4. Reference to other sections**

For further information on personal protection, refer to section 8 and 13.

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## **SECTION 7: Handling and storage**

### **7.1. Precautions for safe handling**

Technical measures      Use only properly specified equipment that is suitable for this product, its supply pressure and temperature.  
In case of doubt, refer to supplier's handling instructions.  
Only experienced and properly instructed persons should handle gases under pressure.  
Service technician must check regularly your entire gas system to ensure that it is leak-free.

Safe handling              The substance must be handled in accordance with good industrial hygiene and safety procedures.  
Refer to supplier's / manufacturer's handling instructions.  
Handle and open container with care. Caution when opening, pressurized container.  
Protect from sunlight and do not expose to temperatures exceeding 50° C (122 °F).  
Do not spray on a naked flame or any incandescent material.  
Do not use in area without adequate ventilation.  
Protect containers from physical damage; do not drag, roll, slide or drop.  
Do not pierce or burn, even after use.  
Leave valve protection caps in place until the container is ready for use.  
Close container valve after each use and when empty, even if still connected to equipment.  
Do not remove or deface labels provided by the supplier for the identification of the container contents.

Industrial hygiene        Ensure adequate ventilation of the working area.  
Do not drink, eat or smoke in the working area.

### **7.2. Conditions for safe storage, including any incompatibilities**

#### *Requirements for storage areas and containers*

Keep containers tightly closed in a dry, cool and well-ventilated place, away from any ignition or heat sources. Store in original container.  
Container valves or caps should be in place. Protect from sunlight and do not expose to temperatures exceeding 50° C (122 °F).

#### *Incompatible materials*

Avoid storage with oxidizing products, acids and, in general, with chemical substances.  
Avoid storage with tools or equipment that can cause sparks.

### **7.3. Specific end use(s)**

For professional users or industrial use only.

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## **SECTION 8: Exposure controls/personal protection**

### **8.1. Control parameters**

**OEL** (Occupational Exposure Limit): No data available.

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Components	CAS No.	TLV-TWA	Control parameters	Font	Year
Isobutane	75-28-5	8 h	800 ppm 1900 mg/m <sup>3</sup>	AGCIH	2010

**DNEL and DMEL** The substance has no harmful effect on human health.

**PNEC** The substance has no harmful effect on the environmental.

## 8.2. Exposure controls

### 8.2.1. Appropriate engineering controls

Ensure adequate ventilation. Wash the hands before and after using the gas. Do not smoke. Personal protective equipment must comply with EU directives: respiratory protective equipment EN 136, 140, 149; eye protection (protective goggles or safety glasses) EN 166; skin protection EN 340, 463, 468, 943-1, 943-2; hands protection (protective gloves) EN374, safety boots EN ISO 20345.

### 8.2.2. Individual protection measures, such as personal protective equipment

**a) Eye/face protection** Safety glasses with side-shields (according to directive EN 166).

#### b) Skin protection

- i) Hand protection Chemical resistant protective gloves (EN 374).  
The penetration time of the gloves should be longer than the period of expected use. Gloves should be replaced immediately if they show sign of wear or deterioration. Use gloves with high cuffs, resistant to hydrocarbons, lined internally and thermally insulated.
- ii) Other Evaluate the need for flame resistant workwear.  
EN ISO 14116 Protective clothing - Protection against heat and flame - Limited flame spread materials.  
EN ISO 1149-5 Protective clothing – Electrostatic properties.  
Wear safety shoes while handling containers.  
EN ISO 20345 Personal protective equipment - Safety shoes.  
Apron or protective clothing are not necessary.

#### c) Respiratory protection

In case of insufficient ventilation, use a self-contained isolating respiratory protective device (EN529). Use full face masks fitted with an AX type filter cartridge (brown for organic vapors and gases). Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.



### 8.2.3. Environmental exposure controls

Handling in accordance with good industrial hygiene and safety practice.  
 Avoid leakage or spillage in the environmental. Avoid dispersion in the air.  
 For more information, see section 13.

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

- a) **Physical state:** Gas
- b) **Colour:** Colourless
- c) **Odour:** Odourless
- d) **Melting point/freezing point:** - 87 °C
- e) **Boiling point or initial boiling point and boiling range:** - 11,76 °C @ 1,013 bar
- f) **Flammability:** Flammable gas
- g) **Lower and upper explosion point:** 1,40 Vol. % - 8,30 Vol. %
- h) **Flash point:** Not applicable to gases and gas mixtures
- i) **Auto-ignition temperature:** 460 °C
- j) **Decomposition temperature:** Not available
- k) **pH:** Not applicable to gases and gas mixtures
- l) **Kinematic viscosity:** Not applicable to gases and gas mixtures
- m) **Solubility (in water):** 54 mg/l
- n) **Partition coefficient n-octanol/water (log value):** 2,80 log Pow
- o) **Vapour pressure:** 347,97 kPa @ 25 °C

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p) <b>Density and/or relative density;</b>	Not applicable to gases and gas mixtures
q) <b>Relative vapour density:</b>	2,01 (air=1)
r) <b>Particle characteristics:</b>	Not applicable to gases and gas mixtures

**9.2. Other information**

Molecular mass	58,12 g/mol.
Critical temperature	134,70 °C
Critical pressure	36,29 bar
Critical density	225 kg/m <sup>3</sup>

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**SECTION 10: Stability and reactivity****10.1. Reactivity**

Stable under normal handling and storage conditions.

**10.2. Chemical stability**

Stable under normal handling and storage conditions.

**10.3. Possibility of hazardous reactions**

May react violently with strong oxidants, acetylene, halogens and nitrogen oxides. Formation of explosive gas mixtures with air.

**10.4. Conditions to avoid**

Keep away from strong oxidants.

Contains gas under pressure, may explode if heated.

Protect from sunlight and do not expose to temperatures exceeding 50 °C.

Keep away from heat, sparks, open flame or other ignition sources. Do not smoke.

Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.

**10.5. Incompatible materials**

Strong oxidants, acetylene, halogens and nitrogen oxides.

**10.6. Hazardous decomposition products**

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

In case of fire hazardous decomposition products may be produced such as: carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>).

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**SECTION 11: Toxicological information****11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008****a) acute toxicity**

<b>Inhalation</b>	Animal species: Rat LC50: 658 000 ppm Exposition time: 4 h
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**b) skin corrosion/irritation** Based on available data, the classification criteria are not met.

**c) serious eye damage/irritation** Based on available data, the classification criteria are not met.

**d) respiratory or skin sensitisation** Based on available data, the classification criteria are not met.

**e) germ cell mutagenicity** Based on available data, the classification criteria are not met.

**f) carcinogenicity** Based on available data, the classification criteria are not met.

**g) reproductive toxicity** Based on available data, the classification criteria are not met.

**h) STOT-single exposure** Based on available data the classification criteria are not met.

**i) STOT-repeated exposure** Based on available data the classification criteria are not met.

**j) aspiration hazard** Based on available data the classification criteria are not met.

**11.2. Information on other hazards**

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High concentrations may cause drowsiness, headache and dizziness. If the amount of oxygen in the air drops below 17% may cause unconsciousness, asphyxia and / or CNS depression.

Inhalation at high concentrations of decomposition products may cause respiratory failure (pulmonary edema).

Contact with compressed gas may cause frostbite and serious ocular injury.

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## SECTION 12: Ecological information

### 12.1. Toxicity

Fish	LC50: 27,98 mg/l Exposure time: 96 h Species: Various Remarks: QSAR, supporting study
Aquatic invertebrates	LC50: 14,22 mg/l Exposure time: 48 h Species: Daphnia magna Remarks: QSAR, supporting study

### 12.2. Persistence and degradability

The substance will be readily biodegradable and it is not expected to persist in the environment.

### 12.3. Bioaccumulative potential

The substance is not considered to be persistent in the environment due to its low log Kow (log Kow < 4).

### 12.4. Mobility in soil

Due to its high volatility, the product is unlikely to cause soil and groundwater pollution.

### 12.5. Results of PBT and vPvB assessment

This product does not meet the PBT or vPvB criteria.

### 12.6. Endocrine disrupting properties

n.a.

### 12.7. Other adverse effects

Ozone Depletion Potential	ODP (R-11=1) = 0
Global Warming Potential	GWP (CO2=1) = 3

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## SECTION 13: Disposal consideration

### 13.1. Waste treatment methods

General information	Take all necessary measures to prevent the production of residuals, value the possible methods of regeneration or recycling. Do not discharge into drains or environment. Dispose of contents and container in accordance with Directive 2008/98/EC and all local, regional, national or international regulations.
Disposal method	Refer to the EIGA Practice Code (Doc. 30 "Gas Disposal", downloadable from <a href="http://www.eiga.org">http://www.eiga.org</a> ) for better guidance on the disposal methods available. Contact the supplier for the correct disposal of the container. Discharging, treatment or disposal may be subject to national, state or local regulations.

### European Waste Code (EWC)

Product 16 05 04\* gases in pressure containers (including halons) containing hazardous substances.

Packaging 15 01 11\* metallic packaging containing a hazardous solid porous matrix (for example asbestos), including empty pressure containers.

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## SECTION 14: Transport information

### 14.1. UN number or ID number

ADR-RID-ADN-IMDG-ICAO UN 2037

### 14.2. UN proper shipping name

ADR-RID-ADN-IMDG-ICAO SMALL CAPACITY CONTAINERS THAT CONTAIN GASES CARTRIDGES OF GAS

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**14.3. Transport hazard class(es)**

ADR-RID-ADN: 2  
 IMDG-ICAO: 2.1



Label: 2.1

**Additional information**

Tunnel restriction code (ADR) D  
 EmS (IMDG) F-D, S-U  
 Limited Quantity (LQ) ADR-RID-ADN-IMDG 1 L



LQ Mark: ADR-RID-ADN-IMDG



LQ Mark: ICAO

**14.4. Packing group**

ADR-RID-ADN-IMDG-ICAO n.a.

**14.5. Environmental hazards**

Dangerous for the environment NO  
 Marine pollutant NO

**14.6. Special precautions for user**

The transport, including loading and unloading, must be carried out by persons who have received appropriate training concerning required by the modal regulations.

Road transport must be carried out by vehicles authorized for the transport of dangerous goods in accordance with the requirements of the current edition of the ADR Agreement and the applicable national provisions. Avoid transport on vehicles where the load space is not separated from the driver's compartment.

Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.

Ensure that containers are firmly secured.

Ensure there is adequate ventilation.

**14.7. Maritime transport in bulk according to IMO instruments**

Not applicable.

**SECTION 15: Regulatory information**

**15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture**

Ozone Depletion Potential ODP (R-11=1) = 0  
 Global Warming Potential GWP (CO2=1) = 3

**Additional regulations/legislations**

Regulation (EU) No. 517/2014  
 Directive Seveso-III 96/82/EC: Included (P2)

**15.2. Chemical safety assessment**

A Chemical Safety Assessment (CSA) has been made for this product.

**SECTION 16: Other information**

This Material Safety Data Sheet has been made in compliance with the European Directive in force.

**Text of hazard (H) and precautionary (P) statements in section 2 and 3**

- H220 Extremely flammable gas
- H280 Contains gas under pressure; may explode if heated
- P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
- P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
- P381 In case of leakage, eliminate all ignition sources.
- P403 Store in a well-ventilated place

**Text of "Hazard Class and Category Code" in section 2 and 3, according to Regulation (EC) No 1272/2008**

Flam. Gas 1A Flammable gas, category 1A





**MATERIAL SAFETY DATA SHEET R600a ISOBUTANE (UN 2037)**  
**Code: TR600BB**

Material safety data sheet according regulation (EU) 2020/878  
Version 6 – Date: 21<sup>st</sup> November, 2022 (replaces version 5 – 06/2022)

Press. Gas (Liq.) Pressurized gas: Liquefied gas

History	Version 6	Version 5	Version 4	Version 3	Version 2	Version 1
	Revision date: 11/2022	Date 06/2021	Date: 05/2019	Date: 11/2015	Date: 05/2015	Date: 03/2011

**b) Abbreviations and acronyms**

ADN	Agreement Dangerous goods by inland waterways
ADR	Accord Dangerous Route
CAS	Chemical Abstracts Service number
CE / EC	European Community
CLP	Classification, Labelling, Packaging
CSA	Chemical Safety Assessment
DNEL	Derived No-Effect Level
DMEL	Derived Minimum Effect Level
EC50	Effective Concentration 50%
EER	Elenco Europeo dei Rifiuti
EIGA	European Industrial Gases Association
EmS	Emergency Schedule
EWC	European Waste Code
GHS	Globally Harmonised System
GWP	Global Warming Potential
HCFC	Hydro-Chloro-Fluoro-Carbons
HFC	Hydro-Fluoro-Carbons
ICAO	International Civil Aviation Organization
IMDG	International Maritime Dangerous Goods code
IMO	International Maritime Organization
LC50	Lethal Concentration 50%
LOAEC	Lowest Observed Adverse Effect Concentration
MARPOL	MARitime POLLution
Log Koc	Logarithm Partition coefficient Soil/water
Log Pow (Kow)	Logarithm Partition coefficient n-Octanol/water
n.a.	not applicable / not available
NOAEC	No Observed Adverse Concentration Level
NOAEL	No Observed Adverse Effect Level
ODP	Ozone Depleting Potential
OEL	Occupational Exposure Limit
PBT	Persistent Bio-accumulative Toxic
PNEC	Predicted No Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RID	Rail International Dangerous goods transport
STOT-RE	Specific Target Effect Concentration-repeated exposure
STOT-SE	Specific Target Effect Concentration-single exposure
TLV	Threshold Limit Value
TWA	Time Weighted Average
UE / EU	European Union
vPvB	very Persistent very Bioaccumulative

**Notice of liability**

This information should not constitute a guarantee for any specific product properties. This information are only a guidance for safe handling, use, processing, storage, transportation, disposal and release and are not to be considered a warranty or a quality specification.

The information contained in this safety data sheet are based on our current knowledge and EU and national laws; they describe the product only with regard to safety requirements. The conditions of the user are beyond our knowledge and control. The product should not be used for purpose other than those specified. It is always the responsibility of the user to take all the necessary measures to comply with the requirements of current legislation. The information contained in this form should not considered as a guarantee of its properties.