Safety Data Sheet

In compliance with Regulation (EU) No. 878/2020
SDS Revision date: 07/11/2022 SDS edition: Revision 08
Replaces the SDS: Rev. 07 of 03/10/2020

GTS POLARPURE GAS R-600a – R-600a

SECTION 1: Identification of the substance or mixture and of the company/firm

1.1 Product identifier

Product type:	Substance
Commercial name:	GTS POLARPURE GAS R-600a, R-600a, Isobutane
Other names:	2-Methylpropane
Name of the substance / mixture	Isobutane
INCI nomenclature:	Isobutane
CAS number:	75-28-5
EEC number:	200-857-2
Index number:	601-004-00-0
Registration number:	01-2119485395-27-XXXX
UFI code:	Not Applicable

1.2 Relevant identified uses of the substance and of the mixture and contraindications

Relevant identified uses:

Industrial use:	Production, distribution, formulation, use as functional fluid.
Professional use:	Use as fuel, use as functional fluid.
Consumer:	Use as fuel.

Contraindications: It is recommended to use the substances / mixture only in the cases indicated previously. No other uses are recommended unless an evaluation has been conducted, prior to the start of the said use, that demonstrates that the risks associated with such uses are under control.

1.3 Information on the supplier of the safety data sheet

Name of Business:	GTS Spa
Address:	Via G. D'Annunzio, 2/75
City / Country:	16121 Genoa (Italy)
Phone:	+39 010 5955981 (office hours)
Contact:	Technical Department
e-mail:	sds.gts@gtsspa.com

1.4 Emergency telephone number

Bergamo:	USSA Clinical Toxicology - 24/7	United Hospitals of Bergamo Largo Barozzi, 1 Toll-free number 800 883300
Genoa:	Poison control centre - 24/7 San Martino Hospital	Largo Rosanna Benzi, 10 Phone: +0039 10352808
Milan:	Poison control centre - 24/7 Niguarda Ca'Granda Hospital	Piazza Ospedale Maggiore, 3 Phone: +0039 26610102

Note: *See Section 16 for a list of poison control centres in Italy*

SECTION 2: Indication of hazards

2.1 Classification of the substance and of the mixture

Classification according to the (EC) n. 1272/2008 [EU-GHS / CLP] regulation

Flammable gas, cat. 1 A:	H220
Liquefied gas under pressure:	H280

Adverse physicochemical effects on human health and the environment

Extremely flammable. Vapours may form flammable and explosive mixture with air. High concentration of vapours may induce: headache, nausea, dizziness. Accidental rapid evaporation of liquid may cause cold burns. For specific information about the toxicological/ecotoxicological properties and classification of this product, see Sect. 11 and/or Sect. 12.

2.2 Label Elements

Classification according to the (EC) n. 1272/2008 [EU-GHS / CLP] regulation

Hazard pictograms (CLP):

GHS02 (Flammable gases, hazard category 1 A) **GHS04 (Gas under pressure: liquefied gas)**

CLP warning: Hazard
Hazard Indications (CLP): H220 - Highly Flammable Gas.
H280 - Contains gas under pressure; may explode if heated.
Safety advice (CLP): P102 - Keep out of reach of children.
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 without risk.
P381 - In case of leakage, eliminate all ignition sources.
P410 + P403 - Store in a well-ventilated place and keep away from sunlight.

Other:
General Directions: Not Applicable - Classified as dangerous according to (EC) n. 1272/2008

2.3 Other hazards

Other hazards not contributing to the classification: A simple asphyxiant gas at normal temperatures and pressures. The product may charge electrostatically: use earthing leads when transferring from one container to another. Gas/air mixtures are explosive. The product is heavier than air and in the event of a leak, vapour may accumulate in confined spaces and low lying areas where it may easily be accidentally ignited. At high concentrations, the vapours can be irritating to the respiratory system. Storage containers and delivery lines may also become cold enough to present a cold burns hazard. Any substance, in case of accidents involving pressurized circuits and the like, may be accidentally injected under the skin, even without external damage. In such a case, the victim should be brought to an hospital as soon as possible, to get specialized medical treatment.

Other information: The substance is not included in the list established in accordance with Article 59(1) of REACH for having endocrine disrupting properties, or is not identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605.

This substance / mixture does not meet the PBT criteria of REACH, annex XIII.
This substance / mixture does not meet the vPvB criteria of REACH, annex XIII.

SECTION 3: Composition / information about ingredients

3.1 Substance

Name of the substance	CAS Num.	EINECS Num.	REACH Num.	% (m/m)	Classification according to the (EC) n. 1272/2008 [EU-GHS / CLP] regulation
Propane (see note*)	74-98-6	200-827-9	01-2119486944-21-XXXX	≤ 3	Flammable gas, cat. 1 H220 Gas under pressure H280
N-butane (see note*)	106-97-8	203-448-7	01-2119474691-32-XXXX	≤ 3	Flammable gas, cat. 1 H220 Gas under pressure H280
Iso-butane (see note*)	75-28-5	200-857-2	01-2119485395-27-XXXX	≥ 97	Flammable gas, cat. 1 H220 Gas under pressure H280

Note *: This product contains < 0.1 % w/w of 1.3 butadiene (EINECS 203-450-8). This product must be regarded as non-carcinogenic and non-mutagenic.
The GWP of the substances used is as follows: Isobutane 3.
The product can also be denatured with 0.1% m/m of trans-1,3,3,3-tetrafluoroprop-1-ene (HFO1234ze) (CAS 29118-24-9 / EINECS 471-480-0) - GWP = 1

3.2 Mixtures

Not Applicable.

SECTION 4: First aid measures

4.1 Description of first aid measures

Description of first aid measures in case of inhalation: Gaseous product: Remove victim to uncontaminated area. If the casualty is breathing: Remove to fresh air, keep the casualty warm and at rest. Place in the recovery position. If breathing is difficult, give oxygen if possible, or assisted ventilation. Obtain medical assistance if breathing remains difficult. If casualty is unconscious and not breathing: ensure that there is no obstruction to breathing and give artificial respiration by trained personnel. If necessary, give external cardiac massage and obtain medical advice. Large amounts of LPG (Liquefied Petroleum Gas) vapours will create an oxygen-deficient atmosphere, and in this case only a Self-contained Breathing Apparatus (SCBA) should be used.

Description of first aid measures in case of contact with the skin:	Liquid product: Rinse the skin with plenty of water. Consult a doctor immediately if irritation, swelling or redness develops and persists. Rapid accidental evaporation of liquid can cause cold burns. In the presence of frostbite symptoms, such as whitening or redness of the skin or a burning or tingling sensation, do not rub, massage or compress the injured area. Consult a specialist doctor or transfer the victim to a hospital.
Description of first aid measures in case of contact with the eyes:	Rinse gently with water for a few minutes. Remove contact lenses, if present, and if the situation allows the operation to be carried out easily. In case of irritation, blurred vision or persistent swelling, consult a medical specialist. In the presence of persistent symptoms of frostbite, such as pain, tingling, tearing or photophobia, or in case of damage caused by high pressure jets, transfer the patient to a specialist health centre. In the case of cold burns from LPG (liquefied petroleum gas) that involve the eyes, prepare for the immediate hospitalization of the victim.
Description of first aid measures in case of ingestion:	Liquid product: Not considered a likely route of exposure – frostbite to the lips and mouth may occur if in contact with the liquid. Immediately consult a doctor/medical service.

4.2 Main symptoms and effects, both acute and delayed

Symptoms / side effects in case of inhalation:	Overexposure to vapours (e.g. through prolonged use in confined, insufficiently ventilated spaces) may cause irritation to airways, nausea and dizziness. Exposure to high concentrations may cause asphyxiation as a consequence of oxygen deficiency.
Symptoms / wounds in case of contact with the skin:	Contact with the liquid can cause cold burns/frostbite.
Symptoms / wounds in case of contact with the eyes:	Contact with eyes may cause a light transient irritation. Contact with the liquefied gas may cause severe ocular lesions.
Symptoms / wounds in case of ingestion:	Not applicable.
Symptoms / wounds in case of intravenous administration:	No information available.
Chronic symptoms:	None to be highlighted, according to the current classification criteria.

4.3 Indication of any need to immediately consult a doctor or the need for special treatments

Immediately begin artificial respiration if breathing has ceased. Administer oxygen if necessary. If there are signs of frostbite, pain, swelling, lachrimation or photophobia persists, or in case of damage from high pressure jets, the patient should be seen in a specialist health care facility. If high-pressure injuries occur, immediately seek professional medical attention.

SECTION 5: Fire fighting measures

5.1 Fire fighting

Suitable extinguishing agent:	In the event of large fires: fractionated water jet, atomised water, foam. In case of small fires: dry chemical powder, carbon dioxide, foam.
Unsuitable fire fighting mediums:	Avoid the simultaneous use of foam and water on the same surface, as water destroys the foam. Do not use direct water jets on the burning product.

5.2 Special hazards deriving from the substance or mixture

Fire hazard:	Highly Flammable Gas.
Explosion hazard:	Vapours are heavier than air, they can expand over the ground and form an explosive atmosphere. Heat can cause increased pressure in tanks exposed to fire, resulting in an explosion of closed containers, spreading of the fire and a risk of burns and injury.
Combustion products:	Incomplete combustion generates carbon monoxide and carbon dioxide, poisonous to animals, and other toxic gases, oxygenated compounds (aldehydes, etc.).

5.3 Recommendations for fire-fighters

Precautionary measures in case of fire:	If security conditions permit, stop or contain the leak at the source. Do not attempt to extinguish the fire until the leak has been contained, or you are sure someone is already taking the necessary actions.
Instructions for extinction:	Keep undamaged containers away from the danger area, if this can be done without danger. Use water jets to cool surfaces and containers exposed to flames or heat. If the fire cannot be controlled, evacuate the area.
Special equipment for fire-fighters:	In the event of a fire or in confined or poorly ventilated spaces, wear a garment complete with fireproof protection and a self-contained breathing apparatus with a positive pressure face mask. Personal protective equipment for fire-fighters (see also section 8). EN 443. EN 469. EN 659.
Other information (fire fighting):	In case of fire, do not dispose of waste water, residual product and other contaminated materials, but collect separately and treat appropriately.

SECTION 6: Measures in case of accidental leak

6.1 Personal precautions, protective equipment and emergency procedures

General measures: If security conditions permit, stop or contain the leak at the source. Avoid direct contact with the leaked material. Make sure to stay upwind. In case of large spills, warn residents of the area downwind of the spill. Eliminate all ignition sources if the safety conditions allow (e.g. electricity, sparks, fires, torches). Use only spark-proof tools. Gas / vapours heavier than air. They can accumulate in enclosed spaces, particularly at or below ground level. Sensors can be used to detect flammable gases or vapours.

6.1.1 For those who do not intervene directly

Protection measures: See Section 8.

Emergency procedures: Evacuate any personnel not involved from the area where the leak occurred. Notify emergency teams. Except in the case of small leaks, the feasibility of interventions must always be evaluated and approved, if possible, by qualified and competent personnel in charge of managing the emergency.

6.1.2 For those who do intervene directly

Protection measures: Small spills: normal antistatic work clothing is generally appropriate. Large spills: total protection garment resistant to chemicals and made of antistatic material. Work gloves (preferably half-arm gloves) that provide adequate resistance to chemical agents. If there is a risk of contact with the liquefied product, the gloves must be thermally insulated in order to avoid cold burns. Gloves made of PVA (polyvinyl alcohol) are not water resistant and are not suitable for emergency use. Antistatic and non-slip safety shoes or boots, resistant to chemicals. Protection measures: Protective goggles and / or face protection devices if there is a risk of splashing or contact with the eyes. Respiratory protection: It is possible to use a half mask or a full mask equipped with filter(s) for organic vapours (AX), or a self-contained breathing apparatus, according to the extent of the leak and the predictable level of exposure. In the event that the situation cannot be fully assessed or if there is a risk of oxygen deficiency, use only a self-contained breathing apparatus.

Emergency procedures: Notify the competent authorities in accordance with the regulations in force.

6.2 Environmental precautions

Stop the leak at the source if you can do so without risk. If this is not the case, use a pulverised water spray to keep the concentration of gas clouds under control and to help them escape into the atmosphere. Prevent the product from ending up in drains, rivers or other bodies of water. Avoid the dispersion of the gas in places where its accumulation could be dangerous (drains, depressions, etc.).

6.3 Methods and materials for containment and remediation

Methods for containment: Allow the product to evaporate, favouring its dispersion. Being heavier than air, vapours can spread at considerable distances at ground level, explode or catch fire, and return to the source. Inside buildings or confined spaces, ensure proper ventilation. If in water: The spillage of liquid product in the water will presumably result in a rapid and complete evaporation. Isolate the area and prevent the risk of fire / explosion for boats and other structures, taking into account the direction and speed of the wind, until the product is completely dispersed.

Cleaning methods: None specified.

Other information (accidental leak): The recommended measures are based on the most likely leakage scenarios for this product. Local conditions (wind, air or water temperature, direction and speed of waves and currents) can significantly influence the choice of action to be taken. Therefore, consult local experts if necessary.

6.4 Reference to other sections

For more information, see section 8: "Exposure control - individual protection".

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Precautions for safe handling: Risk of explosive mixture of vapours and air. Ensure that all provisions regarding the management and storage facilities of flammable products are correctly observed. Do not use electrical appliances (mobile phones, etc.) that are not approved for use, according to the risk characteristics of the area. Take precautionary measures against static electricity. Ensure the grounding of the container, tanks and equipment during receipt and transfer. Gas / vapours heavier than air. Pay particular attention to accumulation in wells and confined spaces. Keep away from heat / sparks / open flames / hot surfaces. No smoking. Use only bottom loading for tanks, in accordance with relevant European legislation. Do not use compressed air during filling, draining or handling operations. Use and store outside or in a well-ventilated area only. Before starting any type of intervention in a confined space (e.g. tunnels), check the atmosphere and check the oxygen content and the degree of flammability. Empty containers may contain combustible

	product residues. Do not perforate, cut, sand, weld, braise, burn or incinerate containers or empty drums that have not been cleaned.
Hygiene measures:	Ensure that proper housekeeping measures are in place. Avoid contact with skin and eyes. Do not breathe vapour. Use adequate personal protective equipment as needed. Keep away from food and beverages. Do not eat, drink or smoke when using this product. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Do not re-use clothes, if they are still contaminated. Contaminated work clothing should not be allowed out of the workplace.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions:	Store in a dry and well-ventilated place. No smoking. Keep away from open flames, hot surfaces and sources of ignition. The vapours are heavier than air, and can spread at ground level. Pay particular attention to accumulation in wells and confined spaces.
Incompatible products:	Keep away from: strong oxidizers.
Storage temperature:	<50°C
Storage place:	The structure of the storage area, the characteristics of the tanks, the equipment and the operating procedures must comply with the relevant European, national or local legislations. The cleaning, inspection and maintenance activities of the internal structure of the storage tanks must be carried out by qualified and correctly equipped personnel, as established by national, local, or company regulations. For maintenance and storage activities, empty tanks must be cleaned and filled with inert gas (e.g. nitrogen). Before accessing storage tanks and starting any type of intervention in a confined space (e.g. tunnels), carry out adequate examination, check the atmosphere and check the oxygen content, as well as the degree of flammability.
Packaging and containers:	Store only in the original container or in a container suitable for the type of product. Keep containers tightly closed and properly labelled. Cylinders must not be stored near other cylinders that contain compressed oxygen. Empty containers may contain combustible product residues. Do not weld, braze, puncture, cut or incinerate empty containers unless they have been properly cleaned / emptied.
Packaging materials:	Use mild steel and stainless steel for containers and linings. Some synthetic materials may not be suitable for containers or linings based on the characteristics of the material and the intended uses. Check the compatibility with the manufacturer, according to the specific conditions of use.

7.3 Specific end uses

No information available.

SECTION 8: Exposure control / individual protection

8.1 Control parameters

8.1.1 National occupational exposure and biological limit values

Germany - Occupational Exposure Limits (TRGS 900)

AGW (OEL TWA)	Propane

Butane (106-97-8)

Austria - Occupational Exposure Limits	
MAK (OEL TWA)	1600 mg/m³
MAK [ppm]	800 ppm
MAK (OEL STEL)	3800
MAK Short time value [ppm]	1600 ppm
Belgium - Occupational Exposure Limits	
OEL TWA	1928 mg/m³
Limit value [ppm]	800 ppm
Denmark - Occupational Exposure Limits	
OEL TWA [1]	1200 mg/m³
OEL TWA [2]	500 ppm
OEL STEL	2400
Grænseværdi (kortvarig) (ppm)	1000 ppm
France - Occupational Exposure Limits	
VLE [mg/m³]	1900 mg/m³
VLE [ppm]	800 ppm
Germany - Occupational Exposure Limits	
AGW (OEL TWA) [1]	2400 mg/m³
AGW (OEL TWA) [2]	1000 ppm
Limitation of exposure peaks (mg/m³)	9600 mg/m³

Limitation of exposure peaks (ppm)	4000 ppm
Hungary - Occupational Exposure Limits	
CK-érték	2350 mg/m³
MK-érték	9400 mg/m³
Poland - Occupational Exposure Limits	
NDS (OEL TWA)	1900
NDSCh (OEL STEL)	3000 mg/m³
Spain - Occupational Exposure Limits	
VLA-ED (OEL TWA) [1]	1935 mg/m³
VLA-ED (OEL TWA) [2]	800 ppm
United Kingdom - Occupational Exposure Limits	
WEL TWA (OEL TWA) [1]	1450 mg/m³
WEL TWA (OEL TWA) [2]	600 ppm
WEL STEL (OEL STEL)	1810 mg/m³
WEL STEL (OEL STEL) [ppm]	750 ppm
Switzerland - Occupational Exposure Limits	
MAK (OEL TWA) [1]	1900 mg/m³
MAK (OEL TWA) [2]	800 ppm
USA - ACGIH - Occupational Exposure Limits	
ACGIH TLV®-TWA (ppm)	1000 ppm (Alkanes, C1-C4)

Iso-butane (75-28-5)

Belgium - Occupational Exposure Limits	
Limit value [ppm]	1000 ppm
Finland - Occupational Exposure Limits	
HTP (OEL TWA) [1]	1900 mg/m³
HTP (OEL TWA) [2]	800 ppm
HTP (OEL STEL)	2400 mg/m³
HTP-arvo (15 min) (ppm)	1000 ppm
Germany - Occupational Exposure Limits (TRGS 900)	
AGW (OEL TWA) [1]	2400 mg/m³
AGW (OEL TWA) [2]	1000 ppm
Limitation of exposure peaks (mg/m³)	9600 mg/m³
Limitation of exposure peaks (ppm)	4000 ppm
Switzerland - Occupational Exposure Limits	
MAK (OEL TWA) [1]	1900 mg/m³
MAK (OEL TWA) [2]	800 ppm

Propane (74-98-6)

Austria - Occupational Exposure Limits	
MAK (OEL TWA)	1800 mg/m³
MAK [ppm]	1000 ppm
MAK (OEL STEL)	3600 mg/m³
MAK Short time value [ppm]	2000 ppm
Belgium - Occupational Exposure Limits	
Limit value [ppm]	1000 ppm
Denmark - Occupational Exposure Limits	
OEL TWA [1]	1800 mg/m³
OEL TWA [2]	1000 ppm
OEL STEL	3600 mg/m³
Grænseværdi (kortvarig) (ppm)	2000 ppm
Finland - Occupational Exposure Limits	
HTP (OEL TWA) [1]	1500 mg/m³
HTP (OEL TWA) [2]	800 ppm
HTP (OEL STEL)	2000 mg/m³
HTP-arvo (15 min) (ppm)	1100 ppm
Germany - Occupational Exposure Limits (TRGS 900)	
AGW (OEL TWA) [1]	1800 mg/m³
AGW (OEL TWA) [2]	1000 ppm

Limitation of exposure peaks (mg/m³)	7200 mg/m³
Limitation of exposure peaks (ppm)	4000 ppm
Latvia - Occupational Exposure Limits	
OEL TWA	1800 mg/m³
OEL TWA (ppm)	1000 ppm
Poland - Occupational Exposure Limits	
NDS (OEL TWA)	1800 mg/m³
Romania - Occupational Exposure Limits	
OEL TWA	1400 mg/m³
OEL TWA (ppm)	778 ppm
OEL STEL (mg/m³)	1800 mg/m³
OEL STEL (ppm)	1000 ppm
Spain - Occupational Exposure Limits	
VLA-ED (OEL TWA) [2]	1000 ppm
Norway - Occupational Exposure Limits	
Grenseverdi (OEL TWA) [1]	900 mg/m³
Grenseverdier (AN) (ppm)	500 ppm
Switzerland - Occupational Exposure Limits	
MAK (OEL TWA) [1]	1800 mg/m³
MAK (OEL TWA) [2]	1000 ppm
VLE [mg/m³]	7200 mg/m³
VLE [ppm]	4000 ppm
USA - ACGIH - Occupational Exposure Limits	
ACGIH TLV®-TWA (ppm)	1000 ppm (Alkanes, C1-C4)

8.1.2 National occupational exposure and biological limit values

Monitoring methods: Monitoring procedures should be chosen according to the indications set by national authorities or labour contracts. Refer to relevant legislation and in any case to the good practice of industrial hygiene.

8.1.3 Air contaminants formed

Applicable OEL and BLV for air contaminants: None known.

8.1.4 DNEL and PNEC

DNEL/DMEL (additional information)
Additional information: Not applicable
PNEC (additional information)
Additional information: Not applicable

Butane (106-97-8)
DNEL/DMEL (additional information)
Additional information: Not applicable
PNEC (additional information)
Additional information: Not applicable
Note: The Derived No Effect Level (DNEL) is an estimated safe level of exposure that is derived from toxicity data in accord with specific guidance within the European REACH regulation. The DNEL may differ from an Occupational Exposure Limit (OEL) for the same chemical. OELs may be recommended by an individual company, a governmental regulatory body or an expert organization, such as the Scientific Committee for Occupational Exposure Limits (SCOEL) or the American Conference of Governmental Industrial Hygienists (ACGIH). OELs are considered to be safe exposure levels for a typical worker in an occupational setting for an 8-hour work shift, 40 hour work week, as a time weighted average (TWA) or a 15 minute short-term exposure limit (STEL). While also considered to be protective of health, OELs are derived by a process different from that of REACH.

8.1.5 Control banding

Control banding: None known.

8.2 Exposure control

Technical control measures: Reduce to a minimum any exposure. Before accessing storage tanks and starting any type of intervention in a confined space (e.g. tunnels), carry out adequate examination, check the atmosphere and check the

oxygen content, as well as the degree of flammability.

Personal protective equipment (for industrial or professional use): Full mask (for the conditions of use, see: "Respiratory protection"). Protective visor. Safety goggles. Protective clothing. Gloves. Safety shoes.

Hand protection: In case of possible contact with the skin, use gloves resistant to hydrocarbons, lined with brushed cotton. Presumably adequate materials: nitrile (NBR) or PVC with a protection index of at least 5 (permeation time ≥240 min). If there is a risk of contact with the liquefied product, the gloves must be thermally insulated in order to avoid cold burns. Use gloves in compliance with the conditions and limits set by the manufacturer. Replace gloves immediately if there are cuts, holes or show any other sign of deterioration. In this case, refer to the UNI EN 374 standard.

Eye protection: In case of possible contact with the eyes, use safety goggles or other protection measures (face shield). In this case, refer to the UNI EN 166 standard.

Skin and body protection: Work clothes with long sleeves. For the definition of the characteristics and performances according to the risks of the work area, refer to the UNI EN 340 standards and to the other applicable UNI-EN-ISO standards. Antistatic and non-slip safety shoes or boots, resistant to chemicals. Remove contaminated clothing and shoes.

Respiratory protection: Regardless of other possible actions (adjustments of the installations, operating procedures and other means to reduce the exposure of workers), it is strongly advised to use individual protection adapted to the needs of the workforce. In ventilated or outdoor environments: in the event of product handling in the absence of suitable vapour containment systems, use masks or half-masks with a hydrocarbon vapour filter (AX). (EN 136/140/145). Combined filtering device (DIN EN 141). In confined spaces (e.g. inside tanks): the use of respiratory protection devices (half-masks, masks, respiratory devices) must be evaluated according to the work activity, the expected duration and the intensity of exposure. For the characteristics, refer to the 02/05/2001 Decree. If exposure levels cannot be determined or estimated with a good level of certainty or if an oxygen deficiency is likely to occur, use a self-contained breathing apparatus only. A large quantity of LPG (liquefied petroleum gas) vapours can lead to a lack of oxygen in the atmosphere. In this case, use a self-contained breathing apparatus only.

Thermal protection: None under normal use conditions.

Atmosphere exposure control: Do not dispose of the product in the environment.

Limitation and control of consumer exposure: It must always be handled in a closed system. Ensure adequate ventilation.

8.3 Hygiene measures

General protective and hygiene rules of the worker: Avoid contact with eyes and skin. Avoid breathing in vapours or mists. Wash with soap and water (if possible neutral soap); do not use irritant products or solvents that remove the sebaceous lining of the skin. Do not reuse contaminated clothing.

SECTION 9: Physical and chemical properties

9.1 Essential physical and chemical properties

Molecular mass:	Not applicable.
Physical state:	Gas
Appearance:	Press. Gas (Liq.).
Colour:	Colourless
Scent:	Odourless. Characteristic, it can be odorised for combustion or automotive use.
Odour threshold:	There is no data available on the preparation itself / on the compound itself.
pH:	Not applicable.
Fusion point:	-187°C - -138°C (depending on the composition)
Freezing point:	Lack of published data - data not available.
Boiling point:	-88°C - -0.5°C (depending on the composition)
Flash point:	< -60°C
Ignition temperature:	287°C - 537°C (depending on the composition)
Decomposition temperature:	Lack of published data - data not available.
Flammability (solid, gas):	Flammable Gas.
Lower / higher flammability or explosive limits in air:	1.86% vol - 9.5% vol (depending on the composition)
Vapour pressure:	275 – 1500 kPa (40 °C - EN ISO 4256)

Vapour pressure at 50 °C:	Lack of published data - data not available
Solubility:	Water: 24.4 - 60.4 mg/l (depending on the composition)
Log Kow:	Not available
Density:	560 – 585 kg/m³ (15 °C - EN ISO 3993)
Relative density:	Lack of published data - data not available.
Relative vapour density at 20 °C:	Lack of published data - data not available.
Kinematic viscosity:	Data not available.
Dynamic viscosity:	Not applicable.
Explosive properties:	Extremely flammable. Heating may cause an explosion.
Oxidising properties:	None (according to composition).
Particle size:	Not applicable
Particle size distribution:	Not applicable
Particle shape:	Not applicable
Particle aspect ratio:	Not applicable
Particle aggregation state:	Not applicable
Particle agglomeration state:	Not applicable
Particle specific surface area:	Not applicable
Particle dustiness:	Not applicable

9.2 Other information

VOC content:	≥90% (EU, CH, USA)
Gas group:	Press. Gas (Liq.)
Evaporation rate in relation to butyl acetate:	Not applicable.

The aforementioned data (9.1 - 9.2) are typical values and do not constitute specifications.

SECTION 10: Stability and reactivity

10.1 Reactivity

The mixture does not present further dangers linked to reactivity in relation to those reported in the subsequent subtitles.

10.2 Chemical stability

Stable product in relation to its intrinsic characteristics.

10.3 Possibility of dangerous reactions

No dangerous reactions are to be expected (in normal conditions of storage and handling). Contact with strong oxidants (such as peroxides and chromates) may cause a fire hazard. A mixture with nitrates or other strong oxidants (such as chlorates, perchlorates and liquid oxygen) can generate an explosive mass. Sensitivity to heat, friction and shock cannot be assessed in advance.

10.4 Conditions to avoid

Keep away from strong oxidizers. Keep away from open flames, hot surfaces and sources of ignition. Avoid the accumulation of electrostatic charges.

10.5 Incompatible materials

Strong oxidizers.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Thermal decomposition can produce: Toxic vapours.

SECTION 11: Toxicological information

Acute toxicity (oral):	Not classified (Based on available data, the classification criteria are not met)
Acute toxicity (dermal):	Not classified (Based on available data, the classification criteria are not met)
Acute toxicity (inhalation):	Not classified (Based on available data, the classification criteria are not met)
Additional information:	(according to composition)

Butano (106-97-8)

CL50 Inalazione - Ratto	1355 mg/m³ 15min - (Alderley Park (SPF)) maschio/femmina
CL50 Inalazione - Ratto [ppm]	570000 ppm 15min - (Alderley Park (SPF)) maschio/femmina, materiale test, isobutano
LC50, maschio, Acuta, inalazione, ratto, locale	1237 mg/l (120 Minuti, Dati sperimentali, 2 (affidabile con restrizioni), studio chiave, materiale test, isobutano)

Propano (74-98-6)	
CL50 Inalazione - Ratto	1442 – 1443 mg/m³ (15 min)
Skin corrosion / skin irritation:	Not classified (Based on available data, the classification criteria are not met) pH: Not applicable.
Additional information:	(according to composition). Contact with the liquid the may cause cold burns/frostbite.
Serious eye damage / eye irritation:	Not classified (Based on available data, the classification criteria are not met). pH: Not applicable.
Additional information:	(according to composition)
Respiratory or skin sensitization:	Not classified (Based on available data, the classification criteria are not met).
Additional information:	(according to composition).
Germ cell mutagenicity:	Not classified (Based on available data, the classification criteria are not met).
Additional information:	(according to composition). This product contains < 0.1 %wt of 1.3 butadiene (EINECS 203-450-8) Not mutagenic.
Carcinogenicity:	Not classified (Based on available data, the classification criteria are not met).
Additional information:	(according to composition) This product contains: butane. This product contains < 0.1 %wt of 1.3 butadiene (EINECS 203-450-8).
Reproductive toxicity:	Not classified (Based on available data, the classification criteria are not met).
Additional information:	(according to composition).
Specific target organ toxicity (STOT) - single exposure:	Not classified (Based on available data, the classification criteria are not met).
Additional information:	(according to composition).
Propane (74-98-6)	
LOAEC (inhalation, rat, gas):	12000 ppmv/4h
NOAEC (inhalation, rat, gas):	4000 – 16000 ppmv/4h
STOT-repeated exposure:	Not classified (Based on available data, the classification criteria are not met).
Additional information:	(according to composition).
Butane	
NOAEC (inhalation, rat, gas, 90 days):	9000 ppmv/6h/day (Sprague-Dawley CD) - male/female
Propane (74-98-6)	
LOAEC (inhalation, rat, gas, 90 days):	12000 ppmv/6h/day
NOAEC (inhalation, rat, gas, 90 days):	9000 ppmv/6h/day (Sprague-Dawley CD) - male/female
Aspiration hazard:	Not classified (Based on available data, the classification criteria are not met).
Additional information:	(according to composition).
Viscosity, kinematic:	Test not required.

11.1 Hazardous decomposition products

11.1.1 Endocrine disrupting properties

Adverse health effects caused by endocrine disrupting properties:	None known,The substance is not included in the list established in accordance with Article 59(1) of REACH for having endocrine disrupting properties, or is not identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605.

11.1.2 Endocrine disrupting properties

Potential adverse human health effects and symptoms:	None expected at ambient temperature. Contact with liquid and with containers and delivery lines from which LPG has just been drawn, should be avoided to prevent cold burns, Exposure to high concentrations may cause asphyxiation as a consequence of oxygen deficiency. Prolonged and repeated skin contact may cause reddening, irritation and dermatitis, due to a defatting effect. Contact with eyes may cause temporary reddening and irritation. High concentration of vapours may induce: headache, nausea, dizziness.
Other information:	None

SECTION 12: Ecological information

12.1 Toxicity

Ecology - general:	Not harmful to aquatic organisms. The dispersion in the environment can however lead to the contamination of the environmental matrices (air). Use according to good working practices and avoid dispersing the product in the environment.
Ecology - air:	In case of dispersion in the environment, the constituents of the product evaporate in the atmosphere, where they undergo rapid degradation processes by the hydroxyl radicals. This phenomenon can contribute to the formation of photochemical smog, but depends on complex interactions with other pollutants, and on local atmospheric conditions.
Ecology - water:	Tests are not necessary, as the substance is a gas (REACH Annex VII-VIII, #2).
Hazardous to the aquatic environment, short-term (acute):	Not classified (Based on available data, the classification criteria are not met).
Hazardous to the aquatic environment, long-term (chronic):	Not classified (Based on available data, the classification criteria are not met).

Butane (106-97-8)

LC50 fish 1	24,11 mg/l 96h - QSAR calculation
EC50 Daphnia 1	14,22 mg/l QSAR calculation
EC50 96h - Algae [1]	7,71 mg/l QSAR calculation

Propane (74-98-6)

LC50 fish 1	49,9 mg/l
EC50 Daphnia 1	27,1 mg/l
EC50 72h - Algae [1]	11,9 mg/l

12.2 Persistence and degradability

Persistence and degradability:	From an environmental point of view, the product must be considered as "non-persistent", according to the criteria of the reg. REACH, Annex XIII (point 1.1).
Biodegradation:	100% (ethane) (16d, Read-across, QSAR).

Butane (106-97-8)

Persistence and degradability	Readily biodegradable.
Biodegradation	50 % after 3.46 days; (calculated QSAR degradation)

Propane (74-98-6)

Persistence and degradability	Readily biodegradable.
Biodegradation	100 % (16d. QSAR Read-Across)

12.3 Bioaccumulative potential

Bioaccumulative potential:	Bioaccumulation unlikely.

Butane (106-97-8)

Log Pow:	2,89
Log Kow:	≤ 3
Bioaccumulative potential:	Low bioaccumulation potential.

Propane (74-98-6)

Bioconcentration factor (BCF REACH):	1,56
Log Kow:	2,36
Bioaccumulative potential:	Low bioaccumulation potential.

12.4 Mobility in soil

Mobility in soil:	Not applicable due to the physical state of product.
Ecology – soil:	Product is easily volatile.

Butane (106-97-8)

Ecology – soil:	Product is easily volatile. No indication of bioaccumulation potential.

Propane (74-98-6)

Ecology – soil:	Product is easily volatile. No indication of bioaccumulation potential.

12.5 Results of PBT and vPvB assessment

This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

Results of PBT-vPvB assessment:	The components in this formulation do not meet the criteria for classification as PBT or vPvB. The product should be considered as "Not persistent" in the environment, according to the REACH Annex XIII criteria (point 1.1).
isobutane (75-28-5)	This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII
butane (106-97-8)	This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII
Propane (74-98-6)	This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

12.6 Endocrine disrupting properties

Adverse effects on the environment caused by endocrine disrupting properties:	Endocrine disrupting properties (Article 57(f) — environment): None known. The substance is not included in the list established in accordance with Article 59(1) of REACH for having endocrine disrupting properties, or is not identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605.

12.7 Other adverse effects

ODP (Ozone Depletion Potential):	0 years. As a standard, trichlorofluoromethane (R-11) is used as a reference point, with an ODP value of 1.0.
GWP (Global Warming Potential):	3 years. It expresses the contribution to the greenhouse effect caused by a gaseous emission into the atmosphere. All molecules have a potential in relation to the CO_2 molecule, which has a potential of 1 and acts as a reference point.

SECTION 13: Considerations for disposal

In the case of disposal, the substance as such, pursuant to Directive 2008/98/EC, must be classified as hazardous waste:
- HP3 - "Flammable".

13.1 Waste treatment methods

Procedure for the method of waste treatment:	The product as such is not specifically regulated. Dispose of empty containers and waste safely.
Disposal recommendations:	Code(s) of the European Waste Characterisation (Decision 2001/118/EC): 16 05 04* (gases in pressure containers [including halons] containing dangerous substances). The EWC code provided is only a general indication, based on the original composition of the product and its intended use. It is up to the user to choose the most appropriate EWC code, based on the actual use of the product and any alterations or contaminations.
Additional information:	Empty containers may contain combustible product residues. Do not perforate, cut, sand, weld, braise, burn or incinerate containers or empty drums that have not been cleaned. Dispose of empty uncleaned containers safely, according to the Legislative Decree 152/2006 and subsequent amendments and additions.
Ecology - waste:	The product as such does not contain halogenated compounds.
EURAL (EWC):	16 05 04* gases in pressure containers [including halons] containing hazardous substances.

SECTION 14: Transport information

According to the requirements of ADR / IMDG / IATA / ADN / RID

ADR	IMDG	IATA	ADN	RID
14.1 UN numbers				
1969	1969	1969	1969	1969
14.2 UN shipping name				
Isobutane	Isobutane	Isobutane	Isobutane	Isobutane
14.3 Transport hazard class(es)				
2.1	2.1	2.1	2.1	2.1
14.4 Packaging group				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.5 Environmental hazards				
Dangerous for the environment: No	Dangerous for the environment: No Marine pollution: No	Dangerous for the environment: No	Dangerous for the environment: No	Dangerous for the environment: No

14.6 Special precautions for users

Special precautions for shipping:	The no-rolling cylinders should be secured vertical - and only transported in a secure position in a well ventilated vehicle or hand truck.

Ground transportation

ADR transport regulations:	Subject to regulations.
Classification code (UN):	2F
Transport category (ADR):	2
Limited quantities (ADR):	0
Hazard No. (Kemler No.)	23
Tunnel restriction code (ADR):	B/D

Sea transportation

IMDG transport regulations:	Subject to regulations.
Exempt quantities (IMDG):	E0
EmS-No. (Fire rating):	F - D
EmS-No. (Spill):	S -U
Stowage category (IMDG):	E
Properties and observations (IMDG):	Liquefied flammable hydrocarbon gas obtained from natural gas or by distillation of mineral oils or coal, etc. May contain propane, cyclopropane, propylene, butane, butylene, etc., in varying proportions. Heavier than air.

Air transport

Regulated by ICAO transport:	Prohibited on passenger aircrafts.
Quantities exempt on passenger and cargo aircrafts (IATA):	E0
CAO max net quantity (IATA):	150kg

Inland waterway transport

Transport regulations (ADN):	Subject to regulations.
Classification code (ADN):	2F
Exempt quantities (ADN):	E0

Railway transport

RID transport regulations:	Subject to regulations.
Classification code (RID):	2F
Exempt quantities (RID):	E0
Transport category (RID):	2
Hazard No. (RID):	23

14.7 Maritime transport in bulk according to IMO instruments

IBC code:	None.

SECTION 15: Regulatory information

15.1 Legislative and regulatory provisions on health, safety and the environment specific to the substance or mixture

The following restrictions apply pursuant to Annex XVII of Regulation (EC) No. 1907/2006 (REACH):

butane ; isobutane ; Propane	Substances classified as flammable gases category 1 or 2, flammable liquids categories 1, 2 or 3, flammable solids category 1 or 2, substances and mixtures which, in contact with water, emit flammable gases, category 1, 2 or 3, pyrophoric liquids category 1 or pyrophoric solids category 1, regardless of whether they appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 or not.

GPL Butane is not subject to Regulation (EU) No 649/2012 of the European Parliament and of the Council of 4 july 2012 concerning the export and import of hazardous chemicals.

GPL Butane is not subject to Regulation (EU) No 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants.

Applicable European Union legislation:	Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). (et sequens). Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on

	classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (et sequens). Directives 89/391/CEE, 89/654/CEE, 89/655/CEE, 89/656/CEE, 90/269/CEE, 90/270/CEE, 90/394/CEE, 90/679/CEE, 93/88/CEE, 95/63/CE, 97/42/CE, 98/24/CE, 99/38/CE, 99/92/CE, 2001/45/CE, 2003/10/CE, 2003/18/CE (Health and safety on the workplace). Directive 2012/18/CE (Control of major-accident hazards involving dangerous substances). Directive 2004/42/CE (Limitation of emissions of Volatile Organic Compounds). Directive 98/24/EC (protection of the health and safety of workers from the risks related to chemical agents at work). Directive 92/85/CE (measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding). Substances Depleting the Ozone layer (1005/2009) - Annex I Substances (ODP). POP (2019/1021) - Persistent Organic Pollutants. Regulation EU (649/2012) - Export and Import of hazardous chemicals (PIC). Commission Delegated Regulation (EU) 2017/2100. Commission Regulation (EU) 2018/605.
National standards:	Legislative Decree 81/2008, relating to the "Implementation of Article 1 of the Law of 3 August 2007, concerning the protection of health and safety in the workplace". Legislative Decree 105/2015 (adoption of Directive 2012/18/EC for the control of major-accident hazards involving dangerous substances). Legislative Decree 152/06: "Environmental regulations", and subsequent amendments and additions to Legislative Decree 151/2001 (Consolidated text of the legislative provisions on the protection and support of maternity and paternity).

15.2 Legislative and regulatory provisions on health, safety and the environment specific to the substance or mixture

A chemical safety assessment has been carried out.

SECTION 16: Other information

Indication of modifications:	All sections have been updated. Format according to COMMISSION REGULATION (EU) 2020/878.

Abbreviations and acronyms:

	N/A = not available
	N/A = not applicable.
ADN	European agreement on the international transport of dangerous goods via inland waterways
ADR	The European Agreement Concerning the International Carriage of Dangerous Goods
ACGIH	American Conference of Governmental Industrial Hygienists
BCF	Bioconcentration factor
CLP calculator	Regulation concerning classification, labelling and packaging; Regulation (EC) No. 1272/2008
DMEL	Derived minimal effect level
DNEL	Derived no-effect level
EC50	Effective concentration for 50% of the tested population (median effective concentration)
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods Code
LC50	Lethal concentration for 50% of the tested population (median lethal concentration)
LD50	Lethal dose that determines the death of 50% of the tested population (median lethal dose)
LOAEL	Lowest-observed-adverse-effect level
NOAEC	No Observed Adverse Effect Concentration
NOAEL	No Observed Adverse Effect Level
NOEC	No Observable Effect Concentration
OECD	Organisation for Economic Co-operation and Development
PBT	Persistent, bio-accumulative and toxic
PNEC	Predicted No Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals, Regulation (EC) No. 1907/2006
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SDS	Safety Data Sheet
STP	Sewage treatment plant
vPvB	very Persistent and very Bio-accumulating

Data sources:	This Safety Data Sheet is based on the characteristics of the components / additives, according to the information provided by the original suppliers.
Professional training tip:	Provide adequate training to professional operators for the use of Personal Protective Equipment (PPE), based on the information contained in this safety data sheet.
Other information:	Do not use the product for purposes other than those indicated by the manufacturer. Container under pressure: Protect against sunlight and do not expose to temperatures exceeding 50°C. Do not perforate or burn, even after use. Do not spray on a flame or an incandescent body.

List of poison control centres in Italy:		
Ancona:	University hospital pharmacovigilance centre - from 7.30 a.m. to 1.30 p.m.	Via Tronto, 10 / A Torrette (Ancona) Phone: +0039 7218102
Bologna:	Ospedale Maggiore - 24/7	Via Largo Negrisoli 2 Phone: +0039 516478955
Catania:	Garibaldi Hospital - 24/7	Piazza Santa Maria di Gesù, 6 Phone +0039 957594120 - +0039 957594032
Cesena:	Maurizio Bufalini Hospital - 24/7	Viale Ghirotti Phone: +0039 547352612
Chieti:	Santissima Annunziata Hospital - 24/7	Via dei Vestini, 1 Phone: +0039 871551219
Florence:	Careggi Hospital - 24/7	Viale Pieraccini, 17 Phone +0039 557947819
La Spezia:	Sant'Andrea Civil Hospital - 24/7	Via Vittorio Veneto, 197 Phone +0039 187533297 - +0039 187533376
Lecce:	Presidium Hospital No.1 - 24/7	Vito Fazzi plant Piazza Muratore, 1 Phone +0039 832351105
Naples:	Cardarelli Hospital - 24/7	Via Cardarelli, 9 Phone: +0039 817472870
Pavia:	National Centre for Toxicological Information Salvatore Maugeri Foundation IRCCS Work and Rehabilitation Clinic - 24/7	Via Salvatore Maugeri, 10 Phone: +0039 38224444
Pordenone:	Civil Hospital -24/7	Via Montereale, 24 Phone: +0039 434550301
Reggio Calabria:	Reunited Hospital - 24/7	Via G. Melacrino, 1 Phone: +0039 965811624
Rome:	A. Gemelli Polyclinic - 24/7	Largo Agostino Gemelli, 8 Phone: +0039 63054343
Rome:	Umberto I Polyclinic - 24/7	Viale del Policlinico Phone: +0039 649978020
Turin:	Anaesthesia and resuscitation institute	Via Achille Mario Dogliotti Phone: +0039 116637637
Trieste:	Admission and Casualty Department, IRCCS Burlo Garofalo	Via dell'Istria 65/1 Phone: +0039 403785373