SAFETY DATA SHEET

According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended

C5H12 0,05 %;C5H12 0,05 %;C6H14 0,05 %;C4H10 0,2 %;C4H10 0,2 %;O2 0,5 %;C3H8 1 %;CO2 1,5 %;N2 4 %;C2H6 4 %;CH4 88,45 %

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name: C5H12 0,05 %;C5H12 0,05 %;C6H14 0,05 %;C4H10 0,2 %;C4H10 0,2 %;O2 0,5 %;C3H8 1 %;CO2 1,5 %;N2 4 %;C2H6 4 %;CH4 88,45 %

Trade name: Prüfgas 11M

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

Identified uses: Industrial and professional use for chemical analysis, calibration, (routine) quality control, laboratory use. Under controlled conditions.

Uses advised against Contact supplier for more information on uses. Uses other than those listed above are not supported.

1.3 Details of the supplier of the safety data sheet

Supplier

Linde Gas GmbH
Carl-von-Linde-Platz 1
A-4651 Stadl-Paura

Telephone: +43 50 4273

E-mail: office@at.linde-gas.com

1.4 Emergency telephone number: Emergency number UMCO: +49 89 220 61012 (German), +44 1865 407333 (English)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 as amended.

Physical Hazards

Flammable gas	Category 1	H220: Extremely flammable gas.
Gases under pressure	Compressed gas	H280: Contains gas under pressure; may explode if heated.

2.2 Label Elements

SAFETY DATA SHEET
According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended
C5H12 0,05 %;C5H12 0,05 %;C6H14 0,05 %;C4H10 0,2 %;C4H10 0,2 %;O2 0,5 %;C3H8 1 %;CO2 1,5 %;N2 4 %;C2H6 4 %;CH4 88,45 %

Signal Word: Danger

Hazard Statement(s):
H220: Extremely flammable gas.
H280: Contains gas under pressure; may explode if heated.

Precautionary Statements

General None.

Prevention: P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response: P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381: In case of leakage, eliminate all ignition sources.

Storage: P403: Store in a well-ventilated place.

Disposal None.

2.3 Other hazards None.

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Chemical name	Chemical formula	Concentration	CAS-No.	REACH Registration No.	M-Factor:	Notes
Pentane	C5H12	500PPM	109-66-0	01-2119459286-30	-	#
2-Methylbutane	C5H12	500PPM	78-78-4	01-2119475602-38	-	#
n-Hexane	C6H14	500PPM	110-54-3	01-2119480412-44	-	#
Butane	C4H10	2.000PPM	106-97-8	01-2119474691-	-	#

				32		
Isobutane	C4H10	2.000PPM	75-28-5	01-2119485395-27	-	#
Oxygen	O2	5.000PPM	7782-44-7	Listed in Annex IV/V of Regulation (EC) No 1907/2006 (REACH), exempted from registration.	-	
Propane	C3H8	1%	74-98-6	01-2119486944-21	-	#
Carbon dioxide	CO2	1,5000%	124-38-9	Listed in Annex IV/V of Regulation (EC) No 1907/2006 (REACH), exempted from registration.	-	#
Nitrogen	N2	4%	7727-37-9	Listed in Annex IV/V of Regulation (EC) No 1907/2006 (REACH), exempted from registration.	-	
Ethane	C2H6	4%	74-84-0	01-2119486765-21	-	
methane	CH4	88,4500%	74-82-8	Listed in Annex IV/V of Regulation (EC) No 1907/2006 (REACH), exempted from registration.	-	

The concentrations of the components in the SDS header, product name on page one and in section 3.2 are in mol due to regulatory requirements. All concentrations are nominal.

This substance has workplace exposure limit(s).
PBT: persistent, bioaccumulative and toxic substance.
vPvB: very persistent and very bioaccumulative substance.

Classification

Chemical name	Classification		Notes
Pentane	CLP:	Flam. Liq. 1;H224, Asp. Tox. 1;H304, STOT SE 3;H336, Aquatic Chronic 2;H411	Note C
2-Methylbutane	CLP:	STOT SE 3;H336, Flam. Liq. 1;H224, Asp. Tox. 1;H304, Aquatic Chronic 2;H411	
n-Hexane	CLP:	Flam. Liq. 2;H225, Repr. 2;H361f, Asp. Tox. 1;H304, STOT RE 2;H373, Skin Irrit. 2;H315, STOT SE 3;H336, Aquatic Chronic 2;H411	
Butane	CLP:	, Flam. Gas 1;H220, Press. Gas Liquef. Gas;H280	
Isobutane	CLP:	, Press. Gas Liquef. Gas;H280, Flam. Gas 1;H220	
Oxygen	CLP:	Press. Gas Compr. Gas;H280, Oxid. Gas 1;H270	
Propane	CLP:	, Press. Gas Liquef. Gas;H280, Flam. Gas 1;H220	
Carbon dioxide	CLP:	Press. Gas Liquef. Gas;H280	
Nitrogen	CLP:	, Press. Gas Compr. Gas;H280	
Ethane	CLP:	, Flam. Gas 1;H220, Press. Gas Liquef. Gas;H280	
methane	CLP:	, Flam. Gas 1;H220, Press. Gas Compr. Gas;H280	

CLP: Regulation No. 1272/2008.
Note C: Some organic substances may be marketed either in a specific isomeric form or as a mixture of several isomers. In this case the supplier must state on the label whether the substance is a specific isomer or a mixture of isomers.

The full text for all H-statements is displayed in section 16.

SAFETY DATA SHEET

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C5H12 0,05 %;C5H12 0,05 %;C6H14 0,05 %;C4H10 0,2 %;C4H10 0,2 %;O2 0,5 %;C3H8 1 %;CO2 1,5 %;N2 4 %;C2H6 4 %;CH4 88,45 %

SECTION 4: First aid measures

General: In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

4.1 Description of first aid measures

Inhalation: In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped. Low concentrations of CO2 cause increased respiration and headache.

Eye contact: Adverse effects not expected from this product.

Skin Contact: Adverse effects not expected from this product.

Ingestion: Ingestion is not considered a potential route of exposure.

4.2 Most important symptoms and effects, both acute and delayed: Respiratory arrest.

4.3 Indication of any immediate medical attention and special treatment needed

Hazards: None.

Treatment: None.

SECTION 5: Firefighting measures

General Fire Hazards: Heat may cause the containers to explode.

5.1 Extinguishing media

Suitable extinguishing media: Water. Dry powder. Foam.

Unsuitable extinguishing media: Carbon Dioxide.

5.2 Special hazards arising from the substance or mixture: Incomplete combustion may form carbon monoxide

5.3 Advice for firefighters

Special fire fighting procedures:	In case of fire: Stop leak if safe to do so. Do not extinguish flames at leak because possibility of uncontrolled explosive reignition exists. Continue water spray from protected position until container stays cool. Use extinguishants to contain the fire. Isolate the source of the fire or let it burn out.
Special protective equipment for fire-fighters:	Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Guideline: EN 469 Protective clothing for firefighters. Performance requirements for protective clothing for firefighting. EN 15090 Footwear for firefighters. EN 659 Protective gloves for firefighters. EN 443 Helmets for fire fighting in buildings and other structures. EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:	Evacuate area. Provide adequate ventilation. Consider the risk of potentially explosive atmospheres . In case of leakage, eliminate all ignition sources. Monitor the concentration of the released product. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.
6.2 Environmental Precautions:	Prevent further leakage or spillage if safe to do so.
6.3 Methods and material for containment and cleaning up:	Provide adequate ventilation. Eliminate sources of ignition.
6.4 Reference to other sections:	Refer to sections 8 and 13.

SAFETY DATA SHEET

According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended

C5H12 0,05 %;C5H12 0,05 %;C6H14 0,05 %;C4H10 0,2 %;C4H10 0,2 %;O2 0,5 %;C3H8 1 %;CO2 1,5 %;N2 4 %;C2H6 4 %;CH4 88,45 %

SECTION 7: Handling and storage:

7.1 Precautions for safe handling:

Only experienced and properly instructed persons should handle gases under pressure. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Purge air from system before introducing gas. Containers, which contain or have contained flammable or explosive substances, must not be inerted with liquid carbon dioxide. Assess the risk of a potentially explosive atmosphere and the need for suitable equipment i.e. explosion-proof. Take precautionary measures against static discharges. Keep away from ignition sources (including static discharges). Provide electrical earthing of equipment and electrical equipment usable in explosive atmospheres. Use non-sparking tools. Refer to supplier's handling instructions. The substance must be handled in accordance with good industrial hygiene and safety procedures. Ensure the complete system has been (or is regularly) checked for leaks before use. Protect containers from physical damage; do not drag, roll, slide or drop. Do not remove or deface labels provided by the supplier for the identification of the container contents. When moving containers, even for short distances, use appropriate equipment eg. trolley, hand truck, fork truck etc. Secure cylinders in an upright position at all times, close all valves when not in use. Provide adequate ventilation. Suck back of water into the container must be prevented. Do not allow backfeed into the container. Avoid suckback of water, acid and alkalis. Keep container below 50°C in a well ventilated place. Observe all regulations and local requirements regarding storage of containers. When using do not eat, drink or smoke. Store in accordance with local/regional/national/international regulations. Never use direct flame or electrical heating devices to raise the pressure of a container. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Damaged valves should be reported immediately to the supplier Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Keep container valve outlets clean and free from contaminates particularly oil and water. If user experiences any difficulty operating container valve discontinue use and contact supplier. Never attempt to transfer gases from one container to another. Container valve guards or caps should be in place.

7.2 Conditions for safe storage, including any incompatibilities:

All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere. Segregate from oxidant gases and other oxidants being stored. Containers should not be stored in conditions likely to encourage corrosion. Stored containers should be periodically checked for general conditions and leakage. Container valve guards or caps should be in place. Store containers in location free from fire risk and away from sources of heat and ignition. Keep away from combustible material.

7.3 Specific end use(s):

None.

SECTION 8: Exposure controls/personal protection

8.1 Control Parameters

Occupational Exposure Limits

Chemical name	Type	Exposure Limit Values		Source
Carbon dioxide	MAK CEIL	10.000 ppm	18.000 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
	MAK	5.000 ppm	9.000 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
	TWA	5.000 ppm	9.000 mg/m3	EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU, 2017/164/EU, as amended (12 2009)
Propane	MAK	1.000 ppm	1.800 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
	MAK CEIL	2.000 ppm	3.600 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
Butane	MAK	800 ppm	1.900 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
	MAK CEIL	1.600 ppm	3.800 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
Isobutane	MAK	800 ppm	1.900 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
	MAK CEIL	1.600 ppm	3.800 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
Pentane	MAK	600 ppm	1.800 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
	MAK CEIL	1.200 ppm	3.600 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
	TWA	1.000 ppm	3.000 mg/m3	EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU, 2017/164/EU, as amended (12 2009)
2-Methylbutane	MAK CEIL	1.200 ppm	3.600 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
	TWA	1.000 ppm	3.000 mg/m3	EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU, 2017/164/EU, as amended (12 2009)
	MAK	600 ppm	1.800 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
n-Hexane	TWA	20 ppm	72 mg/m3	EU. Indicative Exposure Limit Values in

				Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU, 2017/164/EU, as amended (12 2009)
	MAK STEL	80 ppm	288 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)
	MAK	20 ppm	72 mg/m3	Austria. MAK List, OEL Ordinance (GwV), as amended (04 2021)

DNEL-Values

Critical component	Type	Value	Remarks
Pentane	Workers - Dermal, Systemic, long-term	432 mg/kg bw/day	Repeated dose toxicity
	Workers - Inhalation, Systemic, long-term	3000 mg/m3	Repeated dose toxicity
2-Methylbutane	Workers - Dermal, Systemic, long-term	432 mg/kg bw/day	Repeated dose toxicity
	Workers - Inhalation, Systemic, long-term	3000 mg/m3	Repeated dose toxicity
n-Hexane	Workers - Dermal, Systemic, long-term	11 mg/kg bw/day	Neurotoxicity
	Workers - Eyes, Local effect		No data available
	Workers - Inhalation, Systemic, long-term	75 mg/m3	Neurotoxicity

PNEC-Values

Critical component	Type	Value	Remarks
Pentane	Soil	0,55 mg/kg	-
Pentane	Aquatic (freshwater)	230 µg/l	-
Pentane	Sediment (marine water)	1,2 mg/kg	-
Pentane	Aquatic (marine water)	230 µg/l	-
Pentane	Sediment (freshwater)	1,2 mg/kg	-
Pentane	Sewage treatment plant	3600 µg/l	-

8.2 Exposure controls

Appropriate engineering controls:

Consider a work permit system e.g. for maintenance activities. Ensure adequate air ventilation. Provide adequate general and local exhaust ventilation. Keep concentrations well below lower explosion limits. Gas detectors should be used when quantities of flammable gases or vapours may be released. Provide adequate ventilation, including appropriate local extraction, to ensure that the defined occupational exposure limit is not exceeded. Systems under pressure should be regularly checked for leakages. Product to be handled in a closed system. Only use permanent leak tight installations (e.g. welded pipes). Take precautionary measures against static discharges.

Individual protection measures, such as personal protective equipment

General information:

A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered. Keep self contained breathing apparatus readily available for emergency use. Personal protective equipment for the body should be selected based on the task being performed and the risks involved. Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment. Do not eat, drink or smoke when using the product.

Eye/face protection:

Wear eye protection to EN 166 when using gases.
Guideline: EN 166 Personal Eye Protection.

Skin protection

Hand Protection:

Guideline: EN 388 Protective gloves against mechanical risks.
Additional Information: Wear working gloves while handling containers

Body protection:

Wear fire resistant or flame retardant clothing.
Guideline: ISO/TR 2801:2007 Clothing for protection against heat and flame -- General recommendations for selection, care and use of protective clothing.

Other:

Wear safety shoes while handling containers
Guideline: ISO 20345 Personal protective equipment - Safety footwear.

Respiratory Protection:	When allowed by a risk assessment Respiratory Protective Equipment (RPE) may be used The selection of the Respiratory Protective Device (RPD) must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected RPD. Self-contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmospheres Guideline: EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.
Thermal hazards:	No precautionary measures are necessary.
Hygiene measures:	Specific risk management measures are not required beyond good industrial hygiene and safety procedures. Do not eat, drink or smoke when using the product.
Environmental exposure controls:	For waste disposal, see section 13 of the SDS.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state:	Gas
Form:	Compressed gas
Color:	C6H14: Colorless C4H10: Colorless C3H8: Colorless C2H6: Colorless CH4: Colorless O2: Colorless CO2: Colorless N2: Colorless C5H12: Colorless C5H12: Colorless C4H10: Colorless
Odor:	C6H14: Gasoline-like odor O2: Odorless N2: Odorless gas C5H12: Gasoline-like odor C4H10: Gasoline-like or natural gas odor C4H10: Gasoline-like or natural gas odor C3H8: Odorless

	CO2: Odorless C2H6: Odorless CH4: Odorless C5H12: Faint
Odor Threshold:	Odor threshold is subjective and is inadequate to warn of over exposure.
pH:	Not applicable.
Melting Point:	No data available.
Boiling Point:	No data available.
Sublimation Point:	Not applicable.
Critical Temp. (°C):	No data available.
Flash Point:	Not applicable to gases and gas mixtures.
Evaporation Rate:	Not applicable to gases and gas mixtures.
Flammability (solid, gas):	Flammable Gas
Flammability Limit - Upper (%):	Not applicable.
Flammability Limit - Lower (%):	Not applicable.
Vapor pressure:	No reliable data available.
Vapor density (air=1):	0,64 (calculated) (15 °C)
Relative density:	No data available.
Solubility(ies)	
Solubility in Water:	No data available.
Partition coefficient (n-octanol/water):	Not known.
Autoignition Temperature:	Not applicable.
Decomposition Temperature:	Not known.
Viscosity	
Kinematic viscosity:	No data available.
Dynamic viscosity:	No data available.
Explosive properties:	Not applicable.
Oxidizing properties:	Not applicable.

9.2 Other information: None.

SECTION 10: Stability and reactivity

10.1 Reactivity: No reactivity hazard other than the effects described in sub-section below.

10.2 Chemical Stability: Stable under normal conditions.

10.3 Possibility of hazardous reactions: Can form a potentially explosive atmosphere in air. May react violently with oxidants.

10.4 Conditions to avoid: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

10.5 Incompatible Materials: Air and oxidizers. For material compatibility see latest version of ISO-11114.

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

SECTION 11: Toxicological information

General information: None.

11.1 Information on toxicological effects

Acute toxicity - Oral

Product Based on available data, the classification criteria are not met.

Component Information

Pentane	LD 50 (Rat): > 2.000 mg/kg Remarks: Experimental result, Key study
2-Methylbutane	LD 50 (Rat): > 2.000 mg/kg Remarks: Read-across based on grouping of substances (category approach), Key study
n-Hexane	LD 50 (Rat): 16 g/kg

Acute toxicity - Dermal

Product Based on available data, the classification criteria are not met.

Component Information

n-Hexane	LD 50 (Rabbit): > 2.000 mg/kg Remarks: Experimental result, Supporting study

Acute toxicity - Inhalation

Product Based on available data, the classification criteria are not met.

Component Information

Pentane	LC 50 (Rat, 4 h): > 25,3 mg/l Remarks: Vapor Read-across based on grouping of

	substances (category approach), Key study
n-Hexane	LC 50 (Rat, 4 h): 73860 ppm Remarks: Vapor Read-across based on grouping of substances (category approach), Key study
Butane	LC 50 (Rat, 10 min): > 800000 ppm Remarks: Inhalation Experimental result, Key study
Isobutane	LC 50 (Rat, 10 min): > 800000 ppm Remarks: Inhalation Experimental result, Key study
Ethane	LC 50 (Rat, 10 min): > 800000 ppm Remarks: Inhalation Experimental result, Key study
methane	LC 50 (Rat, 10 min): > 800000 ppm Remarks: Inhalation Experimental result, Key study

Repeated dose toxicity

Component Information

Pentane	NOAEL (Rat, Inhalation): 30 mg/l Inhalation Read-across based on grouping of substances (category approach), Key study
2-Methylbutane	NOAEL (Rat(Female, Male), Inhalation, 13 Weeks): > 2.220 ppm(m) Inhalation Experimental result, Key study
Butane	NOAEL (Rat(Female, Male), Inhalation, 13 Weeks): 10.000 ppm(m) Inhalation Read-across based on grouping of substances (category approach), Key study
Isobutane	NOAEL (Rat(Female, Male), Inhalation, 13 Weeks): 10.000 ppm(m) Inhalation Read-across based on grouping of substances (category approach), Key study
Propane	LOAEL (Rat(Female, Male), Inhalation): 21.641 mg/m3 Inhalation Experimental result, Key study
Ethane	NOAEL (Rat(Female, Male), Inhalation, >= 28 d): 4.000 ppm(m) Inhalation Experimental result, Key study NOAEC (Rat, Inhalation): 19678 mg/m³
methane	NOAEL (Rat(Female, Male), Inhalation, 13 Weeks): 10.000 ppm(m) Inhalation Read-across based on grouping of substances (category approach), Key study

Skin Corrosion/Irritation

Product	Based on available data, the classification criteria are not met.

Component Information

Pentane	in vivo (Rabbit): Not classified as an Irritant Experimental result, Key study
2-Methylbutane	in vivo (Rabbit): Not classified as an Irritant Read-across based on grouping of substances (category approach), Key study

Serious Eye Damage/Eye Irritation

Product Based on available data, the classification criteria are not met.

Component Information

Pentane	in vivo (Rabbit, 48 hrs): Not irritatingOECD GHS
2-Methylbutane	in vivo (Rabbit, 24 hrs): Not irritatingOECD GHS
n-Hexane	in vivo (Rabbit, 24 - 72 hrs): Not irritatingEU

Respiratory or Skin Sensitization

Product Based on available data, the classification criteria are not met.

Component Information

Germ Cell Mutagenicity

Product Based on available data, the classification criteria are not met.

In vitro

Component Information

Ethane	Ames test in vitro: (OECD Guideline 471 (Bacterial Reverse Mutation Test)): Negative.
methane	Chromosome aberration (OECD Guideline 473 (In Vitro Mammalian Chromosome Aberration Test)): Negative.

In vivo

Component Information

Ethane	Drosophila Sex-Linked Recessive Lethal Assay (SLRL) test: Negative.
methane	Drosophila Sex-Linked Recessive Lethal Assay (SLRL) test: Negative.

Carcinogenicity

Product Based on available data, the classification criteria are not met.

Reproductive toxicity

Product Based on available data, the classification criteria are not met.

Reproductive toxicity (Fertility)
Component Information

n-Hexane	LC50: 5.000 ppm
methane	Gestation: Rat Inhalation (OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test)) NOAEC: 9.000 ppm Fertility: Rat Inhalation (OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test)) NOAEC: 3.000 ppm

Developmental toxicity (Teratogenicity)
Component Information

methane	Rat Inhalation (OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test)) NOAEC: 9.000 ppm

Specific Target Organ Toxicity - Single Exposure
Product Based on available data, the classification criteria are not met.

Component Information

Specific Target Organ Toxicity - Repeated Exposure
Product Based on available data, the classification criteria are not met.

Aspiration Hazard
Product Not applicable to gases and gas mixtures..

SECTION 12: Ecological information

12.1 Toxicity

Acute toxicity
Product No ecological damage caused by this product.

Acute toxicity - Fish
Component Information

Pentane	LL 50 (Oncorhynchus mykiss, 96 h): 27,55 mg/l (QSAR) Remarks: QSAR QSAR, Key study
2-Methylbutane	LL 50 (Oncorhynchus mykiss, 96 h): 34,05 mg/l (QSAR) Remarks: QSAR QSAR, Key study
n-Hexane	LL 50 (Oncorhynchus mykiss, 96 h): 12,51 mg/l (QSAR) Remarks: QSAR QSAR, Key

	study
Butane	LC 50 (Various, 96 h): 24,11 mg/l (QSAR) Remarks: QSAR QSAR, Key study
Isobutane	LC 50 (Various, 96 h): 24,11 mg/l (QSAR) Remarks: QSAR QSAR, Key study
Propane	LC 50 (Various, 96 h): 49,9 mg/l (QSAR) Remarks: QSAR QSAR, Key study
Ethane	LC 50 (Various, 96 h): 147,54 mg/l (QSAR) Remarks: QSAR QSAR, Key study
methane	LC 50 (Various, 96 h): 49,9 mg/l (QSAR) Remarks: QSAR QSAR, Key study

Acute toxicity - Aquatic Invertebrates

Component Information

Pentane	EC 50 (Daphnia magna, 48 h): 48,11 mg/l (QSAR) Remarks: QSAR QSAR, Key study
2-Methylbutane	EC 50 (Daphnia magna, 48 h): 59,44 mg/l (QSAR) Remarks: QSAR QSAR, Key study
n-Hexane	EC 50 (Daphnia magna, 48 h): 21,85 mg/l (QSAR) Remarks: QSAR QSAR, Key study LC 50 (Water flea (Daphnia magna), 48 h): 45 mmol/m³
Butane	LC 50 (Daphnid, 48 h): 14,22 mg/l (QSAR) Remarks: QSAR QSAR, Key study
Isobutane	LC 50 (Daphnid, 48 h): 14,22 mg/l (QSAR) Remarks: QSAR QSAR, Key study
Propane	LC 50 (Daphnia sp., 48 h): 69,43 mg/l Remarks: QSAR QSAR, Key study
Ethane	LC 50 (Daphnid, 48 h): 16,33 mg/l (QSAR) Remarks: QSAR QSAR, Key study
methane	LC 50 (Daphnia sp., 48 h): 69,43 mg/l Remarks: QSAR QSAR, Key study

Toxicity to microorganisms

Component Information

Ethane	EC50 (Alga, 96 h): 16,5 mg/l
methane	EC 50 (Alga, 96 h): 8,57 mg/l

Chronic Toxicity - Aquatic Invertebrates

Component Information

Pentane	NOAEL (Daphnia magna): 10,76 mg/l (QSAR) QSAR QSAR, Key study

Toxicity to Aquatic Plants

Component Information

Pentane	EC 50 (Green algae (Selenastrum capricornutum), 72 h): 10,7 mg/l NOEC (Green algae (Selenastrum capricornutum), 72 h): 2,04 mg/l
2-Methylbutane	NOEC (Algae (Pseudokirchneriella subcapitata), 72 h): 7,51 mg/l EC 50 (Algae (Pseudokirchneriella subcapitata), 72 h): 10,7 mg/l
Butane	LC50 (Alga, 72 h): 7,7 mg/l

12.2 Persistence and Degradability

Product: Not applicable to gases and gas mixtures..

Biodegradation

Component Information

Butane	50 % (3 d) Detected in water. QSAR, Weight of Evidence study
Isobutane	100 % (385,5 h) Detected in water. Experimental result, Key study
Propane	100 % (385,5 h) Detected in water. Experimental result, Key study
methane	50 % (3,19 d) Detected in water. QSAR, Weight of Evidence study

Photodegradation

Component Information

Pentane	Non-significant photolysis

Stability in water

Component Information

12.3 Bioaccumulative potential

Product: The subject product is expected to biodegrade and is not expected to persist for long periods in an aquatic environment.

Bioconcentration Factor (BCF)

Component Information

Pentane	Pimephales promelas, Bioconcentration Factor (BCF): 171 Aquatic sediment QSAR, Key study
2-Methylbutane	Pimephales promelas, Bioconcentration Factor (BCF): 171 Aquatic sediment Read-across based on grouping of substances (category approach), Key study

12.4 Mobility in soil

Product Because of its high volatility, the product is unlikely to cause ground or water pollution.

Component Information

12.5 Results of PBT and vPvB assessment

Product Not classified as PBT or vPvB.

12.6 Other adverse effects:

Global Warming Potential

Global warming potential: 20,1

SECTION 13: Disposal considerations

13.1 Waste treatment methods

General information: Do not discharge into any place where its accumulation could be dangerous. Consult supplier for specific recommendations. Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with flash back arrestor.

Disposal methods: Refer to the EIGA code of practice (Doc.30 "Disposal of Gases", downloadable at http://www.eiga.org) for more guidance on suitable disposal methods. Dispose of container via supplier only. Discharge, treatment, or disposal may be subject to national, state, or local laws.

European Waste Codes

Container: 16 05 04*: Gases in pressure containers (including halons) containing dangerous substances.

SAFETY DATA SHEET

According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended

C5H12 0,05 %;C5H12 0,05 %;C6H14 0,05 %;C4H10 0,2 %;C4H10 0,2 %;O2 0,5 %;C3H8 1 %;CO2 1,5 %;N2 4 %;C2H6 4 %;CH4 88,45 %

SECTION 14: Transport information

ADR

14.1 UN Number:	UN 1954
14.2 UN Proper Shipping Name:	COMPRESSED GAS, FLAMMABLE, N.O.S.(Methane, Hexane)
14.3 Transport Hazard Class(es)	
Class:	2
Label(s):	2.1
Hazard No. (ADR):	23
Tunnel restriction code:	(B/D)
14.4 Packing Group:	–
14.5 Environmental hazards:	Not applicable
14.6 Special precautions for user:	–

RID

14.1 UN Number:	UN 1954
14.2 UN Proper Shipping Name	COMPRESSED GAS, FLAMMABLE, N.O.S.(Methane, Hexane)
14.3 Transport Hazard Class(es)	
Class:	2
Label(s):	2.1
14.4 Packing Group:	–
14.5 Environmental hazards:	Not applicable
14.6 Special precautions for user:	–

IMDG

14.1 UN Number:	UN 1954
14.2 UN Proper Shipping Name:	COMPRESSED GAS, FLAMMABLE, N.O.S.(Methane, Hexane)
14.3 Transport Hazard Class(es)	
Class:	2.1
Label(s):	2.1
EmS No.:	F-D, S-U
14.4 Packing Group:	–
14.5 Environmental hazards:	Not applicable
14.6 Special precautions for user:	–

IATA

14.1 UN Number: UN 1954
14.2 Proper Shipping Name: Compressed gas, flammable, n.o.s.(Methane, Hexane)
14.3 Transport Hazard Class(es):
Class: 2.1
Label(s): 2.1
14.4 Packing Group: –
14.5 Environmental hazards: Not applicable
14.6 Special precautions for user: –
Other information
Passenger and cargo aircraft: Forbidden.
Cargo aircraft only: Allowed.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code: Not applicable

Additional identification: 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. Before transporting product containers ensure that they are firmly secured. Ensure that the container valve is closed and not leaking. Container valve guards or caps should be in place. Ensure adequate air ventilation.

SECTION 15: Regulatory information

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

EU Regulations

Regulation (EC) No. 1907/2006 Annex XVII Substances subject to restriction on marketing and use:

Chemical name	CAS-No.	Concentration
Pentane	109-66-0	- <0,1%
n-Hexane	110-54-3	- <0,1%
Propane	74-98-6	1,0 - 10%
methane	74-82-8	80 - 90%

Directive 92/85/EEC: on the safety and health of pregnant workers and workers who have recently given birth or are breast feeding.:

Chemical name	CAS-No.	Concentration
Pentane	109-66-0	0 - <0,1%
2-Methylbutane	78-78-4	0 - <0,1%

EU. Directive 2012/18/EU (SEVESO III) on major accident hazards involving dangerous substances, as amended.:

Classification	Lower-tier Requirements	Upper-tier Requirements
P2. FLAMMABLE GASES	10 t	50 t

Directive 98/24/EC on the protection of workers from the risks related to chemical agents at work:

Chemical name	CAS-No.	Concentration
methane	74-82-8	80 - 90%
Butane	106-97-8	0,1 - 1,0%
Isobutane	75-28-5	0,1 - 1,0%
Oxygen	7782-44-7	0,1 - 1,0%
Pentane	109-66-0	0 - <0,1%
2-Methylbutane	78-78-4	0 - <0,1%
n-Hexane	110-54-3	0 - <0,1%

National Regulations

Council Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work Directive 89/686/EEC on personal protective equipment Directive 2014/34/EU on equipment and protective systems intended for use in potentially explosive atmospheres (ATEX) Only products that comply with the food regulations (EC) No. 1333/2008 and (EU) No. 231/2012 and are labelled as such may be used as food additives.
This Safety Data Sheet has been produced to comply with Regulation (EU) 2015/830.

15.2 Chemical safety assessment: No Chemical Safety Assessment has been carried out.

SAFETY DATA SHEET
According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended
C5H12 0,05 %;C5H12 0,05 %;C6H14 0,05 %;C4H10 0,2 %;C4H10 0,2 %;O2 0,5 %;C3H8 1 %;CO2 1,5 %;N2 4 %;C2H6 4 %;CH4 88,45 %

SECTION 16: Other information

Revision Information: Not relevant.

Key literature references and sources for data: Various sources of data have been used in the compilation of this SDS, they include but are not exclusive to:
Agency for Toxic Substances and Diseases Registry (ATSDR) (http://www.atsdr.cdc.gov/).
European Chemical Agency: Guidance on the Compilation of Safety Data Sheets.
European Chemical Agency: Information on Registered Substances http://apps.echa.europa.eu/registered/registered-sub.aspx#search
European Industrial Gases Association (EIGA) Doc. 169 "Classification and Labelling guide", as amended.
International Programme on Chemical Safety (http://www.inchem.org/)
ISO 10156:2010 Gases and gas mixtures - Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets.
Matheson Gas Data Book, 7th Edition.
National Institute for Standards and Technology (NIST) Standard Reference Database Number 69.
The ESIS (European chemical Substances 5 Information System) platform of the former European Chemicals Bureau (ECB) ESIS (http://ecb.jrc.ec.europa.eu/esis/).
The European Chemical Industry Council (CEFIC) ERICards.
United States of America's National Library of Medicine's toxicology data network TOXNET (http://toxnet.nlm.nih.gov/index.html)
Threshold Limit Values (TLV) from the American Conference of Governmental Industrial Hygienists (ACGIH).
Substance specific information from suppliers.
Details given in this document are believed to be correct at the time of publication.

Classification and procedure used to derive the classification for mixtures according to Regulation (EC) 1272/2008 [CLP]

Classification according to Regulation (EC) No 1272/2008 as amended.	Classification procedure
Flammable gas, Category 1	
Gases under pressure, Compressed gas	

SAFETY DATA SHEET

According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended

C5H12 0,05 %;C5H12 0,05 %;C6H14 0,05 %;C4H10 0,2 %;C4H10 0,2 %;O2 0,5 %;C3H8 1 %;CO2 1,5 %;N2 4 %;C2H6 4 %;CH4 88,45 %

Wording of the H-statements in section 2 and 3

H220	Extremely flammable gas.
H224	Extremely flammable liquid and vapor.
H225	Highly flammable liquid and vapor.
H280	Contains gas under pressure; may explode if heated.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H361f	Suspected of damaging fertility.
H373	May cause damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.

Training information: Users of breathing apparatus must be trained. Ensure operators understand the flammability hazard.

Classification according to Regulation (EC) No 1272/2008 as amended.

Flam. Gas 1, H220

Press. Gas Compr. Gas, H280

Other information: Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. Ensure adequate air ventilation. Ensure all national/local regulations are observed. Ensure equipment is adequately earthed. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

Last revised date: 21.03.2022

Disclaimer: This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.