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

1.1 Product identifier
   Product name: C5H12 7000 PPM; O2 19.86%; N2 79.44%

1.2 Relevant identified uses of the substance or mixture and uses advised against
   Identified uses: Industrial and professional. Perform risk assessment prior to use.
   Uses advised against: Consumer use.

1.3 Details of the supplier of the safety data sheet
   Supplier: BOC
   Telephone: 0800 111 333
   E-mail: ReachSDS@boc.com

1.4 Emergency telephone number: 0800 111 333

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture
   Classification according to Directive 67/ 548/ EEC or 1999/ 45/ EC as amended.
   Not classified
   Classification according to Regulation (EC) No 1272/ 2008 as amended.
   Physical Hazards
   - Gases under pressure
   - Compressed gas
   H280: Contains gas under pressure; may explode if heated.

2.2 Label Elements

   Signal Words: Warning
   Hazard Statement(s): H280: Contains gas under pressure; may explode if heated.
   Precautionary Statement
   Prevention: None.
   Response: None.
SAFETY DATA SHEET
C5H12 7000 PPM; O2 19,86 %; N2 79,44 %

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Storage: P403: Store in a well-ventilated place.
Disposal: None.

2.3 Other hazards: None.

SECTION 3: Composition/ information on ingredients

3.2 Mixtures

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Chemical formula</th>
<th>Concentration</th>
<th>CAS-No.</th>
<th>EC No.</th>
<th>REACH Registration No.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>pentane</td>
<td>C5H12</td>
<td>7.000PPM</td>
<td>109-66-0</td>
<td>203-692-4</td>
<td>01-2119459286-30</td>
<td>#</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Classification</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>pentane</td>
<td>DSD: F; R12 Xn; R65 R66 R67 N; R51/ 53</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CLP: Asp. Tox. 1; H304, STOT SE 3; H336, Aquatic Chronic 2; H411, Fiam. Liq. 1; H224</td>
<td>Note C</td>
</tr>
<tr>
<td>oxygen</td>
<td>DSD: O; R8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CLP: OXID. GAS 1; H270, Press. Gas Compr. Gas; H280</td>
<td></td>
</tr>
<tr>
<td>Nitrogen</td>
<td>DSD: none</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CLP: Press. Gas Compr. Gas; H280</td>
<td></td>
</tr>
</tbody>
</table>

DSD: Directive 67/ 548/ EEC.

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 R-phrases and H-statements is displayed in section 16.
SECTION 4: First Aid Measures

General: Adverse effects not expected from this product.

4.1 Description of first aid measures
   Inhalation: Adverse effects not expected from this product.
   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: None.

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: Material will not burn. In case of fire in the surroundings: use appropriate extinguishing agent.
   Unsuitable extinguishing media: None.

5.2 Special hazards arising from the substance or mixture: Supports combustion.

5.3 Advice for firefighters
   Special fire fighting procedures: In case of fire: Stop leak if safe to do so. 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 firefighters: 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: None.

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.

6.4 Reference to other sections: Refer to sections 8 and 13.

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. Refer to supplier's handling instructions. The substance must be handled in accordance with good industrial hygiene and safety procedures. 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: 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

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>type</th>
<th>Exposure Limit Values</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>pentane</td>
<td>TWA</td>
<td>600 ppm 1,800 mg/m³</td>
<td>UK. EH40 Workplace Exposure Limits (WELs) (12 2011)</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>1,000 ppm 3,000 mg/m³</td>
<td>EU. Indicative Exposure Limit Values in Directives 91/ 322/ EEC, 2000/ 39/ EC, 2006/ 15/ EC, 2009/ 161/ EU (12 2009)</td>
</tr>
</tbody>
</table>

DNEL-Values

<table>
<thead>
<tr>
<th>Critical component</th>
<th>type</th>
<th>Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>pentane</td>
<td>Worker - inhalative, long-term - systemic</td>
<td>3000 mg/m³</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Worker - dermal, long-term - systemic</td>
<td>432 mg/kg bw/day</td>
<td>-</td>
</tr>
</tbody>
</table>

PNEC-Values

<table>
<thead>
<tr>
<th>Critical component</th>
<th>type</th>
<th>Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>pentane</td>
<td>Aquatic (freshwater)</td>
<td>230 µg/l</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Soil</td>
<td>0.55 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Sediment (marine water)</td>
<td>1.2 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Sewage treatment plant</td>
<td>3600 µg/l</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Sediment (freshwater)</td>
<td>1.2 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Aquatic (marine water)</td>
<td>230 µg/l</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Aquatic (intermit. releases)</td>
<td>880 µg/l</td>
<td>-</td>
</tr>
</tbody>
</table>

8.2 Exposure controls

Appropriate engineering controls: Consider a work permit system e.g. for maintenance activities. Ensure adequate air ventilation. 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. Preferably use permanent leak tight connections (eg. welded pipes). Do not eat, drink or smoke when using the product.
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. Personal protective equipment for the body should be selected based on the task being performed and the risks involved.


Skin protection
Hand Protection: Wear working gloves while handling containers Guideline: EN 388 Protective gloves against mechanical risks.

Body protection: No special precautions.

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

Respiratory Protection: Not required.

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.

SECTION 9: Physical And Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state: Gas
Form: Compressed gas
Colour:
- C5H12: Colourless
- O2: Colorless
- N2: Colorless
Odour:
- O2: Odorless
- N2: Odorless gas
- C5H12: Gasoline-like odor
Odour Threshold: Odour 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.
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Flash Point: Not applicable to gases and gas mixtures.
Evaporation Rate: Not applicable to gases and gas mixtures.
Flammability (solid, gas): This product is not flammable.
Flammability limit - upper (%): not applicable.
Flammability limit - lower (%): not applicable.
Vapour pressure: No reliable data available.
Vapour density (air=1): 1.02 (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.
Oxidising Properties: not applicable.

9.2 Other information: Gas/ vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

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: None.
10.4 Conditions to Avoid: None.
10.5 Incompatible Materials: No reaction with any common materials in dry or wet conditions.
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
LD 50 (Rat): >2000 mg/kg bw/day

**Acute toxicity - Dermal**
Product: Based on available data, the classification criteria are not met.

**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
LC 50 (2 h): 23500 ppm

**Repeated dose toxicity**
Component information
pentane: NOAEL (Rat(Female, Male), Inhalation): 20,000 mg/m3

**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

**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 irritating OECD GHS

**Respiratory or Skin Sensitisation**
Product: Based on available data, the classification criteria are not met.

**Germ Cell Mutagenicity**
Product: Based on available data, the classification criteria are not met.
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.

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

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
LC 50 (Oncorhynchus mykiss, 96 h): 4.26 mg/l (Static renewal) Remarks: experimental result

Acute toxicity - Aquatic Invertebrates
Component information
pentane
EC 50 (Water flea (Daphnia magna), 48 h): 2.7 mmol/ m³

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

12.2 Persistence and Degradability
Product
Not applicable to gases and gas mixtures.

Photodegradation
Component information
pentane
Non-significant photolysis

Stability in water
Component information
pentane
87 % Non-significant hydrolysis
12.3 Bioaccumulative Potential

Product

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

12.4 Mobility in Soil

Product

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

Component information
pentane

Henry's Law Constant: 7,010 MPa (25 °C)

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: 0
Contains greenhouse gas(es) not covered by 842/2006/EC. Contains greenhouse gas(es). When discharged in large quantities may contribute to the greenhouse effect.

Component information
pentane

Global warming potential: 5

SECTION 13: Disposal Considerations

13.1 Waste treatment methods

General information: Vent to atmosphere in a well ventilated place.

Disposal methods: Dispose of container via supplier only.

European Waste Codes
Container: 16 05 05: Gases in pressure containers other than those mentioned in 16 05 04.
SECTION 14: Transport Information

ADR
14.1 UN Number: UN 1956
14.2 UN Proper Shipping Name: COMPRESSED GAS, N.O.S.(Nitrogen, Oxygen)
14.3 Transport Hazard Class(es)
   Class: 2
   Label(s): 2.2
   Hazard No. (ADR): 20
   Tunnel restriction code: (E)
   Emergency Action Code: 2TE
14.4 Packing Group: -
14.5 Environmental hazards: not applicable
14.6 Special precautions for user: -

RID
14.1 UN Number: UN 1956
14.2 UN Proper Shipping Name: COMPRESSED GAS, N.O.S.(Nitrogen, Oxygen)
14.3 Transport Hazard Class(es)
   Class: 2
   Label(s): 2.2
14.4 Packing Group: -
14.5 Environmental hazards: not applicable
14.6 Special precautions for user: -

IMDG
14.1 UN Number: UN 1956
14.2 UN Proper Shipping Name: COMPRESSED GAS, N.O.S.(Nitrogen, Oxygen)
14.3 Transport Hazard Class(es)
   Class: 2.2
   Label(s): 2.2
   EmS No.: F-C, S-V
14.4 Packing Group: -
14.5 Environmental hazards: not applicable
14.6 Special precautions for user: -

IATA
14.1 UN Number: UN 1956
14.2 Proper Shipping Name: Compressed gas, n.o.s.(Nitrogen, Oxygen)
14.3 Transport Hazard Class(es): Class: 2.2
   Label(s): 2.2
14.4 Packing Group: -
14.5 Environmental hazards: not applicable
14.6 Special precautions for user: -
   Other information
   Passenger and cargo aircraft: Allowed.
   Cargo aircraft only: Allowed.

14.7 Transport in bulk according to Annex II of MARPOL73/78 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:

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>pentane</td>
<td>109-66-0</td>
<td>0.1 - 1.0%</td>
</tr>
</tbody>
</table>

Directive 2004/ 37/ EC on the protection of workers from the risks related to exposure to carcinogens and mutagens at work.:

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>pentane</td>
<td>109-66-0</td>
<td>0.1 - 1.0%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>pentane</td>
<td>109-66-0</td>
<td>0.1 - 1.0%</td>
</tr>
</tbody>
</table>

Directive 96/ 82/ EC (Seveso II): on the control of major accident hazards involving dangerous substances:

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>oxygen</td>
<td>7782-44-7</td>
<td>10 - 20%</td>
</tr>
<tr>
<td>pentane</td>
<td>109-66-0</td>
<td>0.1 - 1.0%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>oxygen</td>
<td>7782-44-7</td>
<td>10 - 20%</td>
</tr>
<tr>
<td>pentane</td>
<td>109-66-0</td>
<td>0.1 - 1.0%</td>
</tr>
</tbody>
</table>
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National Regulations


This Safety Data Sheet has been produced to comply with Regulation (EU) 453/2010.

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

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 Industrial Gases Association (EIGA) Doc. 169 Classification and Labelling guide.
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.
National Institute for Standards and Technology (NIST) Standard Reference Database Number 69.
The ESIS (European chemical Substances 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.
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. EH40 (as amended) Workplace exposure limits.
SAFETY DATA SHEET
C5H12 7000 PPM; O2 19,86 %; N2 79,44 %

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Wording of the R-phrases and H-statements in sections 2 and 3

H224 Extremely flammable liquid and vapour.
H280 Contains gas under pressure; may explode if heated.
H304 May be fatal if swallowed and enters airways.
H336 May cause drowsiness or dizziness.
H411 Toxic to aquatic life with long lasting effects.
R12 Extremely flammable.
R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R65 Harmful: may cause lung damage if swallowed.
R66 Repeated exposure may cause skin dryness or cracking.
R67 Vapours may cause drowsiness and dizziness

Training information:
Ensure operators understand the hazards.

Classification according to Regulation (EC) No 1272/2008 as amended.
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. 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. Note: When the Product Name appears in the SDS header the decimal sign and its position comply with rules for the structure and drafting of international standards, and is a comma on the line. As an example 2,000 is two (to three decimal places) and not two thousand, whilst 1.000 is one thousand and not one (to three decimal places).

Last revised date: 14.04.2016
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.