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

1.1. Product identifier
Product name
Carbon monoxide, compressed.

EC No (from EINECS): 211-128-3
CAS No: 630-08-0
Index-Nr. 006-001-00-2
Chemical formula
CO
REACH Registration number:
01-2119480165-39

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

Relevant identified uses
Industrial and professional. Perform risk assessment prior to use. Substance registered as transported isolated intermediate according to REACH article 18(4). Strictly controlled conditions shall be applied.

Uses advised against
Consumer use.

1.3. Details of the supplier of the safety data sheet

Company identification
BOC, Priestley Road, Worsley, Manchester M28 2UT

E-Mail Address
ReachSDS@boc.com

1.4. Emergency telephone number

Emergency phone numbers (24h):
0800 111 333

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification acc. to Regulation (EC) No 1272/2008/EC (CLP/GHS)
Press. Gas (Compressed gas) - Contains gas under pressure; may explode if heated.
Flam. Gas 1 - Extremely flammable gas.
Repr. 1A - May damage the unborn child.
Acute Tox. 3 - Toxic if inhaled.
STOT RE 1 - Causes damage to organs through prolonged or repeated exposure.

F+, R12 | Repr. Cat.1; R61 | T; R23, R48/23
May cause harm to the unborn child.
Toxic by inhalation.
Toxic: danger of serious damage to health by prolonged exposure through inhalation. Extremely flammable.
Risk advice to man and the environment
Compressed gas.

2.2. Label elements

- Labelling Pictograms

- Signal word
Danger

- Hazard Statements
H280 Contains gas under pressure; may explode if heated.
H220 Extremely flammable gas.
H360 May damage fertility or the unborn child.
H331 Toxic if inhaled.
H372 Causes damage to organs through prolonged or repeated exposure.

- Precautionary Statements

Precautionary Statement Prevention
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P202 Do not handle until all safety precautions have been read and understood.
P260 Do not breathe gas, vapours.

Precautionary Statement Response
P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 Eliminate all ignition sources if safe to do so.
P304+P340+P315 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice/attention.
P308 + P313 IF exposed or concerned: Get medical advice/attention.

Precautionary Statement Storage
P403 Store in a well-ventilated place.
P405 Store locked up.

Precautionary Statement Disposal
None.

2.3. Other hazards
None.
SECTION 3: Composition/information on ingredients

Substance / Mixture: Substance.

3.1. Substances
Carbon monoxide, compressed.
CAS No: 630-08-0
Index-Nr.: 006-001-00-2
EC No (from EINECS): 211-128-3
REACH Registration number: 01-2119480165-39
Contains no other components or impurities which will influence the classification of the product.

3.2. Mixtures
Not applicable.

SECTION 4: First aid measures

4.1. Description of first aid measures

First Aid General Information:
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

First Aid Inhalation:
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

First Aid Skin / Eye:
Adverse effects not expected from this product.

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

4.2. Most important symptoms and effects, both acute and delayed
Symptoms may include dizziness, headache, nausea and loss of co-ordination. Delayed adverse effects possible.

4.3. Indication of any immediate medical attention and special treatment needed
Obtain medical assistance. Recommendations to physicians: Provide oxygen.

SECTION 5: Fire fighting measures

5.1. Extinguishing media
Suitable extinguishing media
All known extinguishants can be used.

5.2. Special hazards arising from the substance or mixture

Specific hazards
Exposure to fire may cause containers to rupture/explode.
Hazardous combustion products
None.

5.3. Advice for firefighters
Specific methods
If possible, stop flow of product. Move container away or cool water from a protected position. Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Prevent water used in emergency cases from entering sewers and drainage systems. Extinguish any other fire.

Special protective equipment for fire fighters
Use self-contained breathing apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Evacuate area. Eliminate ignition sources. Ensure adequate air ventilation. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Consider the risk of potentially explosive atmospheres. Monitor concentration of released product.

6.2. Environmental precautions
Try to stop release.

6.3. Methods and material for containment and cleaning up
Ventilate area.

6.4. Reference to other sections
See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling
Ensure equipment is adequately earthed. Suck back of water into the container must be prevented. Purge air from system before introducing gas. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt. Keep away from ignition sources (including static discharges). Refer to supplier's handling instructions. The substance must be handled in accordance with good industrial hygiene and safety procedures. Avoid exposure, obtain special instructions before use. Avoid suckback of water, acid and alkalis. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Assess the risk of potentially explosive atmosphere and the need for explosion-proof equipment. Consider the use of only non-sparking tools. Do not smoke while handling product. Only experienced and properly instructed persons should handle gases under pressure. Protect cylinders from physical damage; do not drag, roll, slide or drop. Never use direct flame or electrical heating devices to raise the pressure of a container. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. 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. Ensure the complete gas system has been (or is regularly) checked for leaks before use. If user experiences any difficulty operating cylinder valve discontinue use and contact 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. Damaged valves...
should be reported immediately to the supplier. 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. Never attempt to transfer gases from one cylinder/container to another. Installation of a cross purge assembly between the cylinder and the regulator is recommended. Take precautionary measures against static discharges.

7.2. Conditions for safe storage, including any incompatibilities
Secure cylinders to prevent them from falling. Segregate from oxidant gases and other oxidants in store. Keep container below 50°C in a well ventilated place. Observe all regulations and local requirements regarding storage of containers. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent falling over. 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 materials. All electrical equipment in the storage areas should be compatible with the risk of potentially explosive atmosphere.

7.3. Specific end use(s)
Formulation of mixtures with gas in pressure receptacles. Transfilling gas or liquid. Use as a monomer in polymer production, Using gas for metal manufacture pharmaceutical products, Using gas alone or in electronic component manufacture, Use of gas to manufacture pharmaceutical products, Using gas as a laboratory reagent, Use as feedstock in chemical processes, use as Intermediate (transported, on-site isolated)., Use for reagent., Use as feedstock in chemical processes, use as intermediate (transported, on-site isolated)., Use for electronic component manufacture, Use of gas to manufacture pharmaceutical products., Using gas alone or in mixtures for the calibration of analysis equipment., Using gas as a monomer in polymer production., Using gas for metal treatment. Control of polymerisation processes.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Exposure limit value</th>
<th>Value type</th>
<th>value</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOELV 8 hrs (EU)</td>
<td>20 ppm</td>
<td>IOELV 8 hrs (EU)</td>
<td></td>
</tr>
<tr>
<td>IOELV 15 min (EU)</td>
<td>100 ppm</td>
<td>IOELV 15 min (EU)</td>
<td></td>
</tr>
</tbody>
</table>

Derived No Effect Levels

<table>
<thead>
<tr>
<th>Type</th>
<th>Exposure</th>
<th>Value</th>
<th>Population</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNEL</td>
<td>Short term</td>
<td>117 mg/m³</td>
<td>Workers</td>
<td>Systemic</td>
</tr>
<tr>
<td>DNEL</td>
<td>Short term</td>
<td>117 mg/m³</td>
<td>Workers</td>
<td>Local</td>
</tr>
<tr>
<td>DNEL</td>
<td>Long term</td>
<td>23 mg/m³</td>
<td>Workers</td>
<td>Systemic</td>
</tr>
<tr>
<td>DNEL</td>
<td>Long term</td>
<td>23 mg/m³</td>
<td>Workers</td>
<td>Local</td>
</tr>
</tbody>
</table>

The substance is a gas and extremely unlikely to reside in the aquatic compartment. PNEC not available.

8.2. Exposure controls

Appropriate engineering controls
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. Gas detectors should be used when toxic quantities may be released. Keep concentrations well below occupational exposure limits. Gas detectors should be used when quantities of flammable gases/vapours may be released. Keep concentrations well below lower explosion limits. The substance must be handled in accordance with good industrial hygiene and safety procedures. Consider work permit system e.g. for maintenance activities. Use only permanent leak-tight installations (e.g. welded pipes). Systems under pressure should be regularly checked for leakages. Provide adequate general or local ventilation. Product to be handled in a closed system and under strictly controlled conditions.

Personal protective equipment

Eye and face protection
Wear eye protection to EN 166 when using gases.

Skin protection

Hand protection
Advice: Wear working gloves and safety shoes while handling gas cylinders.

Other protection

Wear flame resistant/retardant clothing. Take precautionary measures against static discharges. Wear working gloves and safety shoes while handling gas cylinders.

Respiratory protection

Keep self contained breathing apparatus readily available for emergency use. Use SCBA in the event of high concentrations. 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. When allowed by a risk assessment a supplied air respirator may be used. Respiratory Protective Equipment (RPE) is recommended when conducting operations according to exposure scenarios contained in the extended safety data sheet. Never use any kind of filtering respiratory protection equipment when working with this substance due to it having poor or no warning properties.

Guideline:

Thermal hazards
No required

Environmental Exposure Controls

Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.
SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties
General information
Appearance/Colour: Colourless gas.
Odour: None.
Odour threshold: Odour threshold is subjective and inadequate to warn for over exposure.
Melting point: -205 °C
Boiling point: -192 °C
Flash point: Not applicable for gases and gas mixtures.
Evaporation rate:
Not applicable for gases and gas mixtures.
Vapour Pressure 20 °C: Not applicable.
Relative density, gas: 1
Solubility in water: 30 mg/l
Partition coefficient: n-octanol/water: 1,78 logPow
Autoignition temperature: 620 °C
Explosive properties:
Explosive acc. EU legislation: Not explosive.
Explosive acc. transp. reg.: Not explosive.
Oxidising properties: Not applicable.
Molecular weight: 28 g/mol
Critical temperature: -140 °C
Relative density, liquid: 0,79

9.2. Other information
None.

SECTION 10: Stability and reactivity

10.1. Reactivity
Unreactive under normal conditions.

10.2. Chemical stability
Stable under normal conditions.

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

10.4. Conditions to avoid
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

10.5. Incompatible materials
Air, Oxidiser. 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

11.1. Information on toxicological effects
Acute oral toxicity
Not applicable.

Acute inhalation toxicity
Value: LC50
Species: Rat
Exposure time: 4 h
Value in non-standard unit: 1300 ppm
Value: LC50
Species: Rat
Exposure time: 1 h
Value in non-standard unit: 3760 ppm

Acute dermal toxicity
Not applicable.

Skin irritation
Not applicable.

Eye irritation
Not applicable.

Sensitization
This substance is not classified as a sensitisser.

Repeated dose toxicity
Species: Rat
Route of application: Inhalation
Exposure time: 1 hour/day for 28 consecutive days.
Doses: Low dose
Value type: NOEC
Value: 100 - 900 ppm
No known effects from this product.

Species: Rat
Route of application: Inhalation
Exposure time: 1 hour/day for 28 consecutive days.
Doses: Mid dose
Value type: LOAEC
Value: 100 - 900 ppm
Haematological changes, myocardial fibrosis, increased heart weights, degenerative changes in the testes and secondary changes in the epididymides at the mid- and high dose.

Species: Rat
Route of application: Inhalation
Exposure time: 72 weeks (20hr/day, 5 days/week)
Value type: LOAEC
Value: 200 ppm
Increase in heart weight.

Species: Beagle (dog)
Exposure time: 1 hour/day for 28 consecutive days.
Doses: High dose
Value type: NOEC
Value: 150 - 350 ppm
No known effects from this product.

Assessment mutagenicity
Memo: There is no evidence of mutagenic potential.

Assessment carcinogenicity
No evidence of carcinogenic effects.

Toxicity to reproduction/fertility
Species: Mouse
Route of application: Inhalation
Value type: NOAEC (embryotoxicity)
Exposure: Gestation days 7 to 18
Concentration: 0, 65, 125, 250 and 500 ppm.
Results: 65ppm (nominal)
A NOAEC was set at 65 ppm as at 125 ppm a reduction in
foetal bodyweight was observed.

Species: Mouse
Route of application: Inhalation
Value type: NOAEC (maternal toxicity)
Exposure: Gestation days 7 to 18
Concentration: 0, 65, 125, 250 and 500 ppm.
Results: 500ppm (nominal)
As no signs of toxicity were reported, the highest dose was considered the NOAEC.

Species: Mouse
Route of application: Inhalation
Value type: LOAEC (COHb levels in the maternal and placental blood)
Exposure: Gestation days 8 to 18
Concentration: 0, 65, 125, 250 and 500 ppm.
Results: 65ppm (nominal)
No NOAEC could be obtained, therefore the lowest dose tested, 65 ppm, was considered the LOAEC, based on the amount of COHb detected.

Species: Mouse
Route of application: Inhalation
Value type: NOAEC (maternal toxicity)
Exposure: 23 hours/day. Gestation days 8 to 18
Concentration: 65, 125, 250 and 500 ppm.
Results: 500ppm (nominal)
As no signs of toxicity were reported, the highest dose was considered the NOAEC.

Species: Mouse
Route of application: Inhalation
Value type: NOAEC (embryotoxicity)
Exposure: 23 hours/day. Gestation days 8 to 18
Concentration: 65, 125, 250 and 500 ppm.
No NOAEC can be determined as significant increases in both gross and skeletal malformations were observed at the lowest dose tested.

Species: Mouse
Route of application: Inhalation
Value type: LOAEC (embryotoxicity)
Exposure: 23 hours/day. Gestation days 8 to 18
Concentration: 65, 125, 250 and 500 ppm.
Significant increases in both gross and skeletal malformations were observed at the lowest dose tested.

Assessment toxicity to reproduction
Classified as reproductive toxicant.

Experiences with human exposure
Carbon monoxide binds reversibly to haemoglobin (Hb) to form carboxyhaemoglobin (COHb), reducing the capacity of the blood to transport oxygen.

SECTION 12: Ecological information

12.1. Toxicity

Acute and prolonged toxicity fish
As the substance is a gas which is lighter than air it is highly unlikely to partition into water.

Acute toxicity aquatic invertebrates
As the substance is a gas which is lighter than air it is highly unlikely to partition into water.

Toxicity aquatic plants
As the substance is a gas which is lighter than air it is highly unlikely to partition into water.

Toxicity microorganisms
As the substance is a gas which is lighter than air it is highly unlikely to partition into water.

Chronic toxicity aquatic invertebrates
As the substance is a gas which is lighter than air it is highly unlikely to partition into water.

Toxicity to soil dwelling organisms
The substance is a gas, not applicable.

Toxicity terrestrial plants
Study not necessary due to exposure considerations.

Toxicity other terrestrial non-mammals
Study not necessary due to exposure considerations.

12.2. Persistence and degradability
Will not undergo hydrolysis., Not readily biodegradable.
Inorganic compound.

Stability in water
As the substance is a gas which is lighter than air it is highly unlikely to partition into water. Not known, but considered to have low solubility.

Stability in soil
As the substance is a gas which is lighter than air it is highly unlikely to partition into water. Not known, but considered to have low solubility.

Biodegradation
Not readily biodegradable. Inorganic compound.

12.3. Bioaccumulative potential
Because of the low log Kow, accumulation in organisms is not to be expected.

Bioaccumulation
The substance has no potential for bioaccumulation.

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

Transport between environment compartments
As the substance is a gas which is lighter than air it is highly unlikely to partition into water.

12.5. Results of PBT and vPvB assessment
Not classified as PBT or vPvB.

12.6. Other adverse effects
Not applicable.

Global Warming Potential GWP
When discharged in large quantities may contribute to the greenhouse effect.

1,9

SECTION 13: Disposal considerations

13.1. Waste treatment methods
Must not be discharged to atmosphere. 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. Do not discharge into any place where its accumulation could be dangerous. Contact supplier if guidance is required. Refer to the code of practice of EIGA (Doc.30 “Disposal of Gases”, downloadable at http://www.eiga.org) for more guidance on suitable disposal methods.
Gases in pressure containers (including halons) containing dangerous substances.
EWC Nr. 16 05 04*

SECTION 14: Transport information

ADR/RID

14.1. UN number
1016

14.2. UN proper shipping name
Carbon monoxide, compressed

14.3. Transport hazard class(es)
Class: 2
Classification Code: 1TF
Labels: 2.3, 2.1
Hazard number: 263
Emergency Action Code: 2SE
Tunnel Restriction: (B/D)

14.4. Packing group (Packing Instruction)
P200

14.5. Environmental hazards
None.

14.6. Special precautions for user
None.

IMDG

14.1. UN number
1016

14.2. UN proper shipping name
Carbon monoxide, compressed

14.3. Transport hazard class(es)
Class: 2.3
Labels: 2.3, 2.1
EmS: F-D, S-U

14.4. Packing group (Packing Instruction)
P200

14.5. Environmental hazards
None.

14.6. Special precautions for user
None.

Other transport information
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 cylinder valve is closed and not leaking. Ensure that the valve outlet cap nut or plug (where provided) is correctly fitted. Ensure that the valve protection device (where provided) is correctly fitted. Ensure adequate ventilation. Ensure compliance with applicable regulations.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
Seveso Directive 96/82/EC: Covered

15.2. Chemical safety assessment
CSA has been carried out.

SECTION 16: Other information

Ensure all national/local regulations are observed. Ensure operators understand the flammability hazard. Users of breathing apparatus must be trained. Ensure operators understand the toxicity hazard. Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.

Advice
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. Details given in this document are believed to be correct at the time of going to press.

Further Information
Note:
When using this document care should be taken, as the decimal sign and its position complies 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).

End of document