



SAFETY DATA SHEET

Carbon monoxide, compressed

Issue Date: 16.01.2013
Last revised date: 15.07.2020

Version: 2.1

SDS No.: 000010021698
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SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name: Carbon monoxide, compressed

Trade name: Carbon monoxide 2.0 Chemical, Carbon monoxide 3.7, Carbon monoxide 3.7 Instrument, Carbon monoxide 4.7 Scientific

Additional identification

Chemical name: Carbon monoxide
Chemical formula: CO
INDEX No. 006-001-00-2
CAS-No. 630-08-0
EC No. 211-128-3
REACH Registration No. 01-2119480165-39

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. Catalytic agent Use as an 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 as feedstock in chemical processes. Using gas for metal treatment. Formulation of mixtures with gas in pressure receptacles.

Uses advised against Consumer use.

1.3 Details of the supplier of the safety data sheet

Supplier

Linde Gas UAB
Didlaukio g. 69
LT-08300 Vilnius, Lietuva

Telephone: + 370 52787788

E-mail: sds.ren@linde.com

1.4 Emergency telephone number: Poisons Control and Information Bureau, tel. +370 52 36 20 52

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

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



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Physical Hazards

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

Health Hazards

| | | |
|--|-------------|---|
| Acute toxicity (Inhalation - gas) | Category 3 | H331: Toxic if inhaled. |
| Toxic to reproduction | Category 1A | H360D: May damage the unborn child. |
| Specific Target Organ Toxicity - Repeated Exposure | Category 1 | H372: Causes damage to organs through prolonged or repeated exposure. |

2.2 Label Elements

Contains: Carbon monoxide



Signal Word: Danger

Hazard Statement(s):
H220: Extremely flammable gas.
H280: Contains gas under pressure; may explode if heated.
H331: Toxic if inhaled.
H360D: May damage the unborn child.
H372: Causes damage to organs through prolonged or repeated exposure.

Precautionary Statements
General

None.

Prevention:

P202: Do not handle until all safety precautions have been read and understood.
P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260: Do not breathe gas/vapors.

Response:

P304+P340+P315: IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get immediate medical advice/attention.
P308+P313: IF exposed or concerned: Get medical advice/attention.
P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381: In case of leakage, eliminate all ignition sources.



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

Disposal None.

2.3 Other hazards None.

SECTION 3: Composition/information on ingredients

3.1 Substances

Chemical name Carbon monoxide
INDEX No.: 006-001-00-2
CAS-No.: 630-08-0
EC No.: 211-128-3
REACH Registration No.: 01-2119480165-39
Purity: 100%

The purity of the substance in this section is used for classification only, and does not represent the actual purity of the substance as supplied, for which other documentation should be consulted.

Trade name: Carbon monoxide 2.0 Chemical, Carbon monoxide 3.7, Carbon monoxide 3.7 Instrument, Carbon monoxide 4.7 Scientific

| Chemical name | Chemical formula | Concentration | CAS-No. | REACH Registration No. | M-Factor: | Notes |
|-----------------|------------------|---------------|----------|------------------------|-----------|-------|
| Carbon monoxide | CO | 100% | 630-08-0 | 01-2119480165-39 | - | # |

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.



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SECTION 4: First aid measures

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

Eye contact: May cause temporary eye irritation. Adverse effects not expected from this product.

Skin Contact: Not relevant, due to the form of the product.

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

4.2 Most important symptoms and effects, both acute and delayed: May be fatal if inhaled. Symptoms may include: Dizziness. Headache. Nausea, vomiting. Loss of co-ordination. Symptoms may be delayed.

4.3 Indication of any immediate medical attention and special treatment needed

Hazards: May be fatal if inhaled.

Treatment: Treat with a corticosteroid spray as soon as possible after inhalation. In case of exposure, provide oxygen.

SECTION 5: Firefighting measures

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

5.1 Extinguishing media

Suitable extinguishing media: Use water spray to reduce vapors or divert vapor cloud drift. Water. Dry powder. Foam.

Unsuitable extinguishing media: Carbon Dioxide.

5.2 Special hazards arising from the substance or mixture: Fire or excessive heat may produce hazardous decomposition products. None.



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5.3 Advice for firefighters

Special fire fighting procedures:

In case of fire: Stop leak if safe to do so. Use of water may result in the formation of very toxic aqueous solutions. Keep run-off water out of sewers and water sources. Dike for water control. 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. In case of fire: Stop leak if safe to do so. Keep run-off water out of sewers and water sources. Dike for water control. 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:

Gas tight chemically protective clothing (Type 1) in combination with self contained breathing apparatus. Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.
Guideline: EN 943-2 Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Performance requirements for gas-tight (Type 1) chemical protective suits for emergency teams (ET) 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. Reduce vapour with fog or fine water spray. Keep run-off water out of sewers and water sources. Dike for water control.

6.3 Methods and material for containment and cleaning up:

Provide adequate ventilation. Eliminate sources of ignition. Wash contaminated equipment or sites of leaks with copious quantities of water. Provide adequate ventilation. Eliminate sources of ignition.

6.4 Reference to other sections:

Refer to sections 8 and 13.



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SECTION 7: Handling and storage:

7.1 Precautions for safe handling:

Only experienced and properly instructed persons should handle gases under pressure. Avoid exposure - obtain special instructions before use. 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. Installation of a cross purge assembly between the container and the regulator is recommended. Excess pressure must be vented through an appropriate scrubber system. 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 contaminants 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.



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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. Keep away from food, drink and animal feeding stuffs. 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 monoxide | STEL | 100 ppm 117 mg/m ³ | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU, 2017/164/EU (02 2017) |
| | TWA | 20 ppm 23 mg/m ³ | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU, 2017/164/EU (02 2017) |
| | IPRV | 20 ppm 23 mg/m ³ | Lithuania. OELs. Limit Values for Chemical Substances, General Requirements (06 2018) |
| | TPRV | 100 ppm 117 mg/m ³ | Lithuania. OELs. Limit Values for Chemical Substances, General Requirements (06 2018) |
| Carbon monoxide - Exhaust gases. | IPRV | 20 ppm 25 mg/m ³ | Lithuania. OELs. Limit Values for Chemical Substances, General Requirements (10 2007) |



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DNEL-Values

| Critical component | Type | Value | Remarks |
|--------------------|--|-----------------------|---------|
| Carbon monoxide | Workers - Inhalation, Local, long-term | 23 mg/m ³ | - |
| | Workers - Inhalation, Systemic, short-term | 117 mg/m ³ | - |
| | Workers - Inhalation, Systemic, long-term | 23 mg/m ³ | - |
| | Workers - Inhalation, Local, short-term | 117 mg/m ³ | - |

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 occupational exposure limits. Gas detectors should be used when toxic quantities may be released. Gas detectors should be used when quantities of flammable gases or vapours may be released. Systems under pressure should be regularly checked for leakages. Product to be handled in a closed system and under strictly controlled conditions. Only use permanent leak tight installations (e.g. welded pipes). Take precautionary measures against static discharges. 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. Keep self contained breathing apparatus readily available for emergency use. Keep suitable chemically resistant protective clothing readily available for emergency use. Personal protective equipment for the body should be selected based on the task being performed and the risks involved. Protect eyes, face and skin from contact with product. Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

Eye/face protection:

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



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Skin protection

Hand Protection:

Guideline: EN 388 Protective gloves against mechanical risks.
Additional Information: Wear working gloves while handling containers
Guideline: EN 374-1/2/3 Protective gloves against chemicals and micro-organisms.
Additional Information: Chemically resistant gloves complying with EN 374 should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

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:

Reference should be made to European Standard EN 689 for methods for the assessment of exposure by inhalation to chemical agents and national guidance documents for methods for the determination of hazardous substances. 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. Never use any kind of filtering respiratory protection equipment when working with this substance due to it having poor or no warning properties.
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:

Obtain special instructions before use. 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:

Colorless



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| | |
|--|--|
| Odor: | Odorless |
| Odor Threshold: | Odor threshold is subjective and is inadequate to warn of over exposure. |
| pH: | Not applicable. |
| Melting Point: | -205 °C Experimental result, Key study |
| Boiling Point: | -191,5 °C (1.013,25 hPa) Experimental result, Key study |
| Sublimation Point: | Not applicable. |
| Critical Temp. (°C): | -140,0 °C |
| 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 (%): | 74 %(V) Other, Supporting study |
| Flammability Limit - Lower (%): | 10,9 %(V) |
| Vapor pressure: | > 101,325 kPa (20 °C) |
| Vapor density (air=1): | 0,968 AIR=1 |
| Relative density: | 0,97 (20 °C) |
| Solubility(ies) | |
| Solubility in Water: | 29 g/l (20 °C) |
| Partition coefficient (n-octanol/water): | 1,78 |
| Autoignition Temperature: | +/- 607 °C Experimental result, Key study |
| 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.

Molecular weight: 28,01 g/mol (CO)

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.



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| | |
|--|--|
| 10.3 Possibility of hazardous reactions: | Can form a potentially explosive atmosphere in air. May react violently with oxidants. |
| 10.4 Conditions to avoid: | Avoid moisture in the installation. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. |
| 10.5 Incompatible Materials: | Air and oxidizers. Moisture. 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: Carbon monoxide: Has been shown to produce adverse effects to the cardiovascular, central nervous, and reproductive systems in laboratory animals and chronically exposed humans.

11.1 Information on toxicological effects

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

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

Acute toxicity - Inhalation Product
Toxic if inhaled.

Carbon monoxide
LC 50 (Rat, 4 h): 1300 ppm
LC 50 (Rat, 1 h): 3760 ppm

Repeated dose toxicity
Carbon monoxide
LOAEL (Rat(Female), Inhalation, 72 Weeks): 200 ppm(m) Inhalation Experimental result, Key study
LOAEC (Rat, Inhalation): 200 ppm (Target Organ(s): Respiratory system)

Skin Corrosion/Irritation Product Based on available data, the classification criteria are not met.



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Carbon monoxide Not classified as an irritant.

Serious Eye Damage/Eye Irritation

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

Carbon monoxide Not classified as an irritant.

Respiratory or Skin Sensitization

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

Carbon monoxide No known effects from this product.

Germ Cell Mutagenicity

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

Carbon monoxide There is no evidence of mutagenic potential.

Carcinogenicity

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

Carbon monoxide No evidence of carcinogenic effects.

Reproductive toxicity

Product May damage fertility or the unborn child.

Carbon monoxide May damage fertility or the unborn child.

Reproductive toxicity (Fertility)

Carbon monoxide NOAEC (embryotoxicity): 65 ppm

Developmental toxicity (Teratogenicity)

Carbon monoxide LOAEC: 125 ppm



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Specific Target Organ Toxicity - Single Exposure

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

Carbon monoxide

Route of Exposure: Inhalation

Target Organ(s): Blood

Causes damage to red blood cells (haemolytic poison). Carbon monoxide binds reversibly to haemoglobin (Hb) to form carboxyhaemoglobin (CoHb), reducing the capacity of the blood to transport oxygen.

Specific Target Organ Toxicity - Repeated Exposure

Product Causes damage to organs through prolonged or repeated exposure.

Carbon monoxide

Route of Exposure: Inhalation

Target Organ(s): Heart

Risk of serious health injuries in case of long term exposure.

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

Carbon monoxide

LC 50 (Fish (no species mentioned)): 672,6 mg/l Remarks: QSAR QSAR, Supporting study

Acute toxicity - Aquatic Invertebrates

Carbon monoxide

LC 50 (48 h): 307,5 mg/l Remarks: QSAR QSAR, Supporting study

12.2 Persistence and Degradability

Product Not applicable to gases and gas mixtures..

Carbon monoxide

Will not undergo hydrolysis.



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Biodegradation

Carbon monoxide

Not readily biodegradable. Inorganic compound.

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.

Carbon monoxide

Because of the low log Kow, accumulation in organisms is not expected.

12.4 Mobility in soil Product

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

Carbon monoxide

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

12.5 Results of PBT and vPvB assessment Product

Not classified as PBT or vPvB.

12.6 Other adverse effects:

No ecological damage caused by this product.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

General information:

Must not be discharged to atmosphere. Consult supplier for specific recommendations.

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.



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SECTION 14: Transport information

ADR

| | |
|------------------------------------|-----------------------------|
| 14.1 UN Number: | UN 1016 |
| 14.2 UN Proper Shipping Name: | CARBON MONOXIDE, COMPRESSED |
| 14.3 Transport Hazard Class(es) | |
| Class: | 2 |
| Label(s): | 2.3, 2.1 |
| Hazard No. (ADR): | 263 |
| 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 1016 |
| 14.2 UN Proper Shipping Name | CARBON MONOXIDE, COMPRESSED |
| 14.3 Transport Hazard Class(es) | |
| Class: | 2 |
| Label(s): | 2.3, 2.1 |
| 14.4 Packing Group: | – |
| 14.5 Environmental hazards: | Not applicable |
| 14.6 Special precautions for user: | – |

IMDG

| | |
|------------------------------------|-----------------------------|
| 14.1 UN Number: | UN 1016 |
| 14.2 UN Proper Shipping Name: | CARBON MONOXIDE, COMPRESSED |
| 14.3 Transport Hazard Class(es) | |
| Class: | 2.3 |
| Label(s): | 2.3, 2.1 |
| EmS No.: | F-D, S-U |
| 14.4 Packing Group: | – |
| 14.5 Environmental hazards: | Not applicable |
| 14.6 Special precautions for user: | – |



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IATA

14.1 UN Number: UN 1016
14.2 Proper Shipping Name: Carbon monoxide, compressed
14.3 Transport Hazard Class(es):
Class: 2.3
Label(s): –
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: Forbidden.

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:

The packaging shall be visibly, legibly and indelibly marked as follows:
Restricted to professional users.

| Chemical name | CAS-No. | Concentration |
|-----------------|----------|---------------|
| Carbon monoxide | 630-08-0 | 100% |

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



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| Chemical name | CAS-No. | Concentration |
|-----------------|----------|---------------|
| Carbon monoxide | 630-08-0 | 100% |

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

| Classification | Lower-tier Requirements | Upper-tier Requirements |
|---|-------------------------|-------------------------|
| H2: ACUTE TOXIC (Category 2, all exposure routes; Category 3, inhalation) | 50 t | 200 t |
| P2: Flammable gases, Category 1 or 2 | 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 |
|-----------------|----------|---------------|
| Carbon monoxide | 630-08-0 | 100% |

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: Chemical Safety Assessment has been carried out.

SECTION 16: Other information

Revision Information: Not relevant.



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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 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.

Wording of the H-statements in section 2 and 3

| | |
|-------|---|
| H220 | Extremely flammable gas. |
| H280 | Contains gas under pressure; may explode if heated. |
| H331 | Toxic if inhaled. |
| H360D | May damage the unborn child. |
| H372 | Causes damage to organs through prolonged or repeated exposure. |

Training information:

Users of breathing apparatus must be trained. Ensure operators understand the toxicity hazard. Ensure operators understand the flammability hazard.

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

Flam. Gas 1, H220
Acute Tox. 3, H331
Repr. 1A, H360D
STOT RE 1, H372
Press. Gas Compr. Gas, H280



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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.

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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.



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Annex to the extended Safety Data Sheet (eSDS)

Content

| | |
|----------------------|---|
| Exposure Scenario 1. | Formulation & (re)packing of substances and mixtures, Industrial use |
| Exposure Scenario 2. | Using gas for metal treatment., Industrial use |
| Exposure Scenario 3. | Use for electronic component manufacture., Industrial use |
| Exposure Scenario 4. | Use of gas to manufacture pharmaceutical products., Industrial use |
| Exposure Scenario 5. | Using gas as feedstock in chemical processes., Industrial use |
| Exposure Scenario 6. | Using gas alone or in mixtures for the calibration of analysis equipment., Professional use |

Exposure Scenario 1.

Exposure Scenario worker

1. Formulation & (re)packing of substances and mixtures, Industrial use

| | |
|--------------------------|--|
| List of use descriptors | |
| Sector(s) of use | |
| Product categories [PC]: | |

| | |
|---|--|
| Name of contributing environmental scenario and corresponding ERC | <u>Formulation & (re)packing of substances and mixtures:</u> ERC2: Formulation into mixture |
|---|--|

| | |
|------------------------|--|
| Contributing Scenarios | <u>Formulation & (re)packing of substances and mixtures:</u> PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities |
|------------------------|--|

2.1. Contributing exposure scenario controlling environmental exposure for: Formulation & (re)packing of substances and mixtures

Product characteristics



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| | |
|--|---|
| Concentration of the substance in a mixture: | Covers percentage substance in the product up to 100 %. |
|--|---|

| | |
|------------------------------|---------------------------|
| Physical form of the product | See section 9 of the SDS. |
|------------------------------|---------------------------|

| | |
|----------------------|--------------------|
| Viscosity: | |
| Kinematic viscosity: | No data available. |
| Dynamic viscosity: | No data available. |

Amounts used

| |
|--|
| The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release |
|--|

Frequency and duration of use

| | |
|---------------------|-------------------|
| Batch process: | 220 Emission days |
| Continuous process: | not relevant |

Environment factors not influenced by risk management

Other given operational conditions affecting environmental exposure

| | |
|---------------------------------------|--------------|
| Other relevant operational conditions | not relevant |
|---------------------------------------|--------------|

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

| |
|---|
| See section 8 of the safety data sheet (Environmental exposure controls). |
|---|

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

| | |
|-----------|---|
| Air | Handle substance within a closed system. Effectiveness: 100 %. |
| Soil | not relevant |
| Water | not relevant |
| Sediment: | not relevant |



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| | |
|----------|--------------|
| Remarks: | not relevant |
|----------|--------------|

Organisational measures to prevent/limit release from site:

| |
|------|
| none |
|------|

Conditions and measures related to sewage treatment plant

| | |
|----------------------------------|--|
| type: | not relevant |
| Discharge rate: | not relevant |
| Treatment effectiveness: | not relevant |
| Sludge treatment technique: | not relevant |
| Measures to limit air emissions: | not relevant |
| Remarks: | Wastewater emission controls are not applicable as there is no direct release to wastewater. |

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

| Suitable waste treatment | Treatment effectiveness | Remarks |
|---------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

| Suitable recovery operations: | Treatment effectiveness | Remarks |
|-------------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Additional good practice advice beyond the REACH Chemical Safety Report

| |
|--|
| Ensure operatives are trained to minimise releases |
|--|

2.2. Contributing exposure scenario controlling worker exposure for: Formulation & (re)packing of substances and mixtures

| | |
|---------------------|--|
| Process Categories: | PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC8b: Transfer of substance or mixture (charging and discharging) |
|---------------------|--|



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| | |
|--|-------------------------|
| | at dedicated facilities |
|--|-------------------------|

Product characteristics

| | |
|--|---|
| Concentration of the substance in a mixture: | Covers percentage substance in the product up to 100 %. |
|--|---|

| | |
|-------------------------------|---------------------------|
| Physical form of the product: | See section 9 of the SDS. |
| Vapour pressure: | > 101,325 kPa |
| Process temperature: | >= 20 °C |
| Remarks | not relevant |

Amounts used

| |
|--|
| The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release |
|--|

Frequency and duration of use

| | Use duration: | Frequency of use: | Remarks |
|-----------------|---------------|-------------------|---------|
| Hours per shift | 8 h | 5 days per week | |

Human factors not influenced by risk management

| |
|------------------------------------|
| This information is not available. |
|------------------------------------|

Other given operational conditions affecting workers exposure

| | |
|--|-----------------------------|
| Other relevant operational conditions: | . See section 8 of the SDS. |
|--|-----------------------------|

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

| |
|--|
| See section 8 of the safety data sheet |
|--|

Technical conditions and measures to control dispersion from source towards the worker

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------|-----------------|--------------|---------------|------------------------|
| Provide a basic | | | | Chemical production or |



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| | | | | |
|--|--|--|--|---|
| standard of general ventilation (1 to 3 air changes per hour). | | | | refinery in closed process without likelihood of exposure or processes with equivalent containment conditions |
| Provide a basic standard of general ventilation (1 to 3 air changes per hour). | | | | Transfer of substance or mixture (charging and discharging) at dedicated facilities |
| Local exhaust ventilation | | | | Transfer of substance or mixture (charging and discharging) at dedicated facilities |

Organisational measures to prevent/limit releases, dispersion and exposure

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------------|-----------------|--------------|---------------|---------|
| See section 7 of the SDS. | | | | |

Conditions and measures related to personal protection, hygiene and health evaluation

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------|-----------------|--------------|---------------|--|
| | | | | See section 8 of the safety data sheet (Personal protection equipment) |

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system Apply a good standard of general or controlled ventilation when maintenance activities are carried out. Ensure operatives are trained to minimise exposure Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed

3. Exposure estimation

Environment:
Formulation & (re)packing of substances and mixtures:
ERC2:



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| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|------------------------|----------------|
| Air | | < 1 | ECETOC TRA, EUSES v2.1 | Closed systems |

ERC2:

| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|------------------------|--|
| Water | | < 1 | ECETOC TRA, EUSES v2.1 | The exposure of aquatic, terrestrial, sediment and sewage treatment microorganisms is considered to be negligible because the substance partitions primarily to air when released to the environment. The resulting environmental exposure is not expected to add significantly to already present background levels of the gas in the environment |

Health:

Formulation & (re)packing of substances and mixtures:

PROC1:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---------------------------------|---|-------------------------|---------|------------------------|---------|
| inhalative, long-term, systemic | Indoor use, without local exhaust ventilation | 0,011 mg/m ³ | < 0,001 | ECETOC TRA, EUSES v2.1 | none |

PROC1:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---|---|-------------------------|----------|------------------------|---------|
| inhalative, short-term, systemic, (acute) | Indoor use, without local exhaust ventilation | 0,023 mg/m ³ | <= 0,001 | ECETOC TRA, EUSES v2.1 | none |

PROC8b:



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| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---------------------------------|--|------------------------|-------|------------------------|---------|
| inhalative, long-term, systemic | Indoor use, with local exhaust ventilation | 17,5 mg/m ³ | 0,761 | ECETOC TRA, EUSES v2.1 | none |

PROC8b:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---|--|----------------------|-------|------------------------|---------|
| inhalative, short-term, systemic, (acute) | Indoor use, with local exhaust ventilation | 35 mg/m ³ | 0,299 | ECETOC TRA, EUSES v2.1 | none |

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

Check that RMMs and OCs are as described above or of equivalent efficiency Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see <http://www.ecetoc.org/tra>

Exposure Scenario 2.

Exposure Scenario worker

1. Using gas for metal treatment., Industrial use

| | |
|--|--|
| List of use descriptors | |
| Sector(s) of use | SU14: Manufacture of basic metals, including alloys SU15: Manufacture of fabricated metal products, except machinery and equipment |
| Product categories [PC]: | PC14: Metal surface treatment products |
| Name of contributing environmental scenario and corresponding ERC | <u>Using gas for metal treatment.:</u> ERC6b: Use of reactive processing aid at industrial site (no inclusion into or onto article) |
| Contributing Scenarios | <u>Using gas for metal treatment.:</u> PROC22: Manufacturing and processing of minerals and/or metals at |



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| | |
|--|------------------------------------|
| | substantially elevated temperature |
|--|------------------------------------|

2.1. Contributing exposure scenario controlling environmental exposure for: Using gas for metal treatment., Industrial use

Product characteristics

| | |
|--|---|
| Concentration of the substance in a mixture: | Covers percentage substance in the product up to 100 %. |
|--|---|

| | |
|------------------------------|---------------------------|
| Physical form of the product | See section 9 of the SDS. |
|------------------------------|---------------------------|

| | |
|----------------------|--------------------|
| Viscosity: | |
| Kinematic viscosity: | No data available. |
| Dynamic viscosity: | No data available. |

Amounts used

The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release

Frequency and duration of use

| | |
|---------------------|-------------------|
| Batch process: | 220 Emission days |
| Continuous process: | not relevant |

Environment factors not influenced by risk management

Other given operational conditions affecting environmental exposure

| | |
|---------------------------------------|--------------|
| Other relevant operational conditions | not relevant |
|---------------------------------------|--------------|

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil



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| | |
|-----------|---|
| Air | Handle substance within a closed system. Effectiveness: 100 %. |
| Soil | not relevant |
| Water | not relevant |
| Sediment: | not relevant |
| Remarks: | not relevant |

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

| | |
|----------------------------------|--|
| type: | not relevant |
| Discharge rate: | not relevant |
| Treatment effectiveness: | not relevant |
| Sludge treatment technique: | not relevant |
| Measures to limit air emissions: | not relevant |
| Remarks: | Wastewater emission controls are not applicable as there is no direct release to wastewater. |

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

| Suitable waste treatment | Treatment effectiveness | Remarks |
|---------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

| Suitable recovery operations: | Treatment effectiveness | Remarks |
|-------------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Additional good practice advice beyond the REACH Chemical Safety Report

Ensure operatives are trained to minimise releases



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2.2. Contributing exposure scenario controlling worker exposure for: Using gas for metal treatment., Industrial use

| | |
|---------------------|--|
| Process Categories: | PROC22: Manufacturing and processing of minerals and/or metals at substantially elevated temperature |
|---------------------|--|

Product characteristics

| | |
|--|---|
| Concentration of the substance in a mixture: | Covers percentage substance in the product up to 100 %. |
|--|---|

| | |
|-------------------------------|---------------------------|
| Physical form of the product: | See section 9 of the SDS. |
| Vapour pressure: | > 101,325 kPa |
| Process temperature: | >= 20 °C |
| Remarks | not relevant |

Amounts used

The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release

Frequency and duration of use

| | Use duration: | Frequency of use: | Remarks |
|-----------------|---------------|-------------------|---------|
| Hours per shift | 8 h | 5 days per week | |

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

| | |
|--|-----------------------------|
| Other relevant operational conditions: | . See section 8 of the SDS. |
|--|-----------------------------|

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker



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| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|--|-----------------|--------------|---------------|--|
| Provide a basic standard of general ventilation (1 to 3 air changes per hour). | | | | Manufacturing and processing of minerals and/or metals at substantially elevated temperature |
| Local exhaust ventilation | | | | Manufacturing and processing of minerals and/or metals at substantially elevated temperature |

Organisational measures to prevent/limit releases, dispersion and exposure

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------------|-----------------|--------------|---------------|---------|
| See section 7 of the SDS. | | | | |

Conditions and measures related to personal protection, hygiene and health evaluation

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------|-----------------|--------------|---------------|--|
| | | | | See section 8 of the safety data sheet (Personal protection equipment) |

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system Apply a good standard of general or controlled ventilation when maintenance activities are carried out. Ensure operatives are trained to minimise exposure Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed

3. Exposure estimation

Environment:
Using gas for metal treatment., Industrial use:
ERC6b:

| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|--------|---------|
|-------------|-----|-----|--------|---------|



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| | | | | |
|-----|--|-----|------------------------|----------------|
| Air | | < 1 | ECETOC TRA, EUSES v2.1 | Closed systems |
|-----|--|-----|------------------------|----------------|

ERC6b:

| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|------------------------|--|
| Water | | < 1 | ECETOC TRA, EUSES v2.1 | The exposure of aquatic, terrestrial, sediment and sewage treatment microorganisms is considered to be negligible because the substance partitions primarily to air when released to the environment. The resulting environmental exposure is not expected to add significantly to already present background levels of the gas in the environment |

Health:

Using gas for metal treatment., Industrial use:

PROC22:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---------------------------------|--|------------------------|-------|------------------------|---------|
| inhalative, long-term, systemic | Indoor use, with local exhaust ventilation | 11,7 mg/m ³ | 0,509 | ECETOC TRA, EUSES v2.1 | none |

PROC22:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---|--|------------------------|-----|------------------------|---------|
| inhalative, short-term, systemic, (acute) | Indoor use, with local exhaust ventilation | 23,4 mg/m ³ | 0,2 | ECETOC TRA, EUSES v2.1 | none |

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES



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Check that RMMs and OCs are as described above or of equivalent efficiency Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see <http://www.ecetoc.org/tra>

Exposure Scenario 3.

Exposure Scenario worker

1. Use for electronic component manufacture., Industrial use

| List of use descriptors | |
|---|--|
| Sector(s) of use | SU16: Manufacture of computer, electronic and optical products, electrical equipment |
| Product categories [PC]: | PC33: Semiconductors |
| Name of contributing environmental scenario and corresponding ERC | <u>Use for electronic component manufacture.:</u> ERC6a: Use of intermediate |
| Contributing Scenarios | <u>Use for electronic component manufacture.:</u> PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions |

2.1. Contributing exposure scenario controlling environmental exposure for: Use for electronic component manufacture., Industrial use

| Product characteristics | |
|--|---|
| Concentration of the substance in a mixture: | Covers percentage substance in the product up to 100 %. |
| Physical form of the product | See section 9 of the SDS. |
| Viscosity: | |
| Kinematic viscosity: | No data available. |
| Dynamic viscosity: | No data available. |
| Amounts used | |



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The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release

Frequency and duration of use

| | |
|---------------------|-------------------|
| Batch process: | 220 Emission days |
| Continuous process: | not relevant |

Environment factors not influenced by risk management

Other given operational conditions affecting environmental exposure

| | |
|---------------------------------------|--------------|
| Other relevant operational conditions | not relevant |
|---------------------------------------|--------------|

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

| | |
|-----------|---|
| Air | Handle substance within a closed system. Effectiveness: 100 %. |
| Soil | not relevant |
| Water | not relevant |
| Sediment: | not relevant |
| Remarks: | not relevant |

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

| | |
|-----------------|--------------|
| type: | not relevant |
| Discharge rate: | not relevant |



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| | |
|----------------------------------|--|
| Treatment effectiveness: | not relevant |
| Sludge treatment technique: | not relevant |
| Measures to limit air emissions: | not relevant |
| Remarks: | Wastewater emission controls are not applicable as there is no direct release to wastewater. |

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

| Suitable waste treatment | Treatment effectiveness | Remarks |
|---------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

| Suitable recovery operations: | Treatment effectiveness | Remarks |
|-------------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Additional good practice advice beyond the REACH Chemical Safety Report

Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Use for electronic component manufacture., Industrial use

| | |
|---------------------|---|
| Process Categories: | PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions |
|---------------------|---|

Product characteristics

| | |
|--|---|
| Concentration of the substance in a mixture: | Covers percentage substance in the product up to 100 %. |
| Physical form of the product: | See section 9 of the SDS. |
| Vapour pressure: | > 101,325 kPa |
| Process temperature: | >= 20 °C |
| Remarks | not relevant |



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Amounts used

The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release

Frequency and duration of use

| | Use duration: | Frequency of use: | Remarks |
|-----------------|---------------|-------------------|---------|
| Hours per shift | 8 h | 5 days per week | |

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Other relevant operational conditions: . See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|--|-----------------|--------------|---------------|--|
| Provide a basic standard of general ventilation (1 to 3 air changes per hour). | | | | Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions |

Organisational measures to prevent/limit releases, dispersion and exposure

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------------|-----------------|--------------|---------------|---------|
| See section 7 of the SDS. | | | | |



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Conditions and measures related to personal protection, hygiene and health evaluation

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------|-----------------|--------------|---------------|--|
| | | | | See section 8 of the safety data sheet (Personal protection equipment) |

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system Apply a good standard of general or controlled ventilation when maintenance activities are carried out. Ensure operatives are trained to minimise exposure Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed

3. Exposure estimation

Environment:

Use for electronic component manufacture., Industrial use:

ERC6a:

| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|------------------------|----------------|
| Air | | < 1 | ECETOC TRA, EUSES v2.1 | Closed systems |

ERC6a:

| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|------------------------|--|
| Water | | < 1 | ECETOC TRA, EUSES v2.1 | The exposure of aquatic, terrestrial, sediment and sewage treatment microorganisms is considered to be negligible because the substance partitions primarily to air when released to the environment. The resulting environmental exposure is not expected to add significantly to already present background levels of the gas in the environment |



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Health:

Use for electronic component manufacture., Industrial use:

PROC1:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---------------------------------|---|-------------------------|---------|------------------------|---------|
| inhalative, long-term, systemic | Indoor use, without local exhaust ventilation | 0,011 mg/m ³ | < 0,001 | ECETOC TRA, EUSES v2.1 | none |

PROC1:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---|---|-------------------------|----------|------------------------|---------|
| inhalative, short-term, systemic, (acute) | Indoor use, without local exhaust ventilation | 0,023 mg/m ³ | <= 0,001 | ECETOC TRA, EUSES v2.1 | none |

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

Check that RMMs and OCs are as described above or of equivalent efficiency. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see <http://www.ecetoc.org/tra>

Exposure Scenario 4.

Exposure Scenario worker

1. Use of gas to manufacture pharmaceutical products., Industrial use

| | |
|---|---|
| List of use descriptors | |
| Sector(s) of use | SU9: Manufacture of fine chemicals |
| Product categories [PC]: | PC29: Pharmaceuticals |
| Name of contributing environmental scenario and corresponding ERC | Use of gas to manufacture pharmaceutical products.: ERC6a: Use of intermediate |
| Contributing Scenarios | Use of gas to manufacture pharmaceutical products.: |



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| | |
|--|---|
| | <p>PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions</p> <p>PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition</p> |
|--|---|

2.1.Contributing exposure scenario controlling environmental exposure for: Use of gas to manufacture pharmaceutical products., Industrial use

Product characteristics

| | |
|--|---|
| Concentration of the substance in a mixture: | Covers percentage substance in the product up to 100 %. |
| Physical form of the product | See section 9 of the SDS. |
| Viscosity: | |
| Kinematic viscosity: | No data available. |
| Dynamic viscosity: | No data available. |

Amounts used

The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release

Frequency and duration of use

| | |
|---------------------|-------------------|
| Batch process: | 220 Emission days |
| Continuous process: | not relevant |

Environment factors not influenced by risk management

Other given operational conditions affecting environmental exposure

| | |
|---------------------------------------|--------------|
| Other relevant operational conditions | not relevant |
|---------------------------------------|--------------|



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Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

| | |
|-----------|---|
| Air | Handle substance within a closed system. Effectiveness: 100 %. |
| Soil | not relevant |
| Water | not relevant |
| Sediment: | not relevant |
| Remarks: | not relevant |

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

| | |
|----------------------------------|--|
| type: | not relevant |
| Discharge rate: | not relevant |
| Treatment effectiveness: | not relevant |
| Sludge treatment technique: | not relevant |
| Measures to limit air emissions: | not relevant |
| Remarks: | Wastewater emission controls are not applicable as there is no direct release to wastewater. |

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

| Suitable waste treatment | Treatment effectiveness | Remarks |
|---------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:



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| Suitable recovery operations: | Treatment effectiveness | Remarks |
|-------------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Additional good practice advice beyond the REACH Chemical Safety Report

Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Use of gas to manufacture pharmaceutical products., Industrial use

| | |
|---------------------|--|
| Process Categories: | PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition |
|---------------------|--|

Product characteristics

| | |
|--|---|
| Concentration of the substance in a mixture: | Covers percentage substance in the product up to 100 %. |
| Physical form of the product: | See section 9 of the SDS. |
| Vapour pressure: | > 101,325 kPa |
| Process temperature: | >= 20 °C |
| Remarks | not relevant |

Amounts used

The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release

Frequency and duration of use

| | Use duration: | Frequency of use: | Remarks |
|-----------------|---------------|-------------------|---------|
| Hours per shift | 8 h | 5 days per week | |

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure



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| | |
|--|-----------------------------|
| Other relevant operational conditions: | . See section 8 of the SDS. |
|--|-----------------------------|

| |
|---------------------------------------|
| Risk management measures (RMM) |
|---------------------------------------|

| |
|---|
| Technical conditions and measures at process level (source) to prevent release |
|---|

| |
|--|
| See section 8 of the safety data sheet |
|--|

| |
|---|
| Technical conditions and measures to control dispersion from source towards the worker |
|---|

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|--|-----------------|--------------|---------------|--|
| Provide a basic standard of general ventilation (1 to 3 air changes per hour). | | | | Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions |
| Local exhaust ventilation | | | | Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions |
| Provide a basic standard of general ventilation (1 to 3 air changes per hour). | | | | Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition |
| Local exhaust ventilation | | | | Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition |

| |
|---|
| Organisational measures to prevent/limit releases, dispersion and exposure |
|---|



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| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------------|-----------------|--------------|---------------|---------|
| See section 7 of the SDS. | | | | |

Conditions and measures related to personal protection, hygiene and health evaluation

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------|-----------------|--------------|---------------|--|
| | | | | See section 8 of the safety data sheet (Personal protection equipment) |

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system Apply a good standard of general or controlled ventilation when maintenance activities are carried out. Ensure operatives are trained to minimise exposure Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed

3. Exposure estimation

Environment:

Use of gas to manufacture pharmaceutical products., Industrial use:

ERC6a:

| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|------------------------|----------------|
| Air | | < 1 | ECETOC TRA, EUSES v2.1 | Closed systems |

ERC6a:

| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|------------------------|---|
| Water | | < 1 | ECETOC TRA, EUSES v2.1 | The exposure of aquatic, terrestrial, sediment and sewage treatment microorganisms is considered to be negligible because the substance partitions primarily to air when released to the environment. The resulting environmental exposure is |



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| | | | | |
|--|--|--|--|--|
| | | | | not expected to add significantly to already present background levels of the gas in the environment |
|--|--|--|--|--|

Health:

Use of gas to manufacture pharmaceutical products., Industrial use:

PROC2:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---------------------------------|--|------------------------|-------|------------------------|---------|
| inhalative, long-term, systemic | Indoor use, with local exhaust ventilation | 5,84 mg/m ³ | 0,254 | ECETOC TRA, EUSES v2.1 | none |

PROC2:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---|--|------------------------|-----|------------------------|---------|
| inhalative, short-term, systemic, (acute) | Indoor use, with local exhaust ventilation | 11,7 mg/m ³ | 0,1 | ECETOC TRA, EUSES v2.1 | none |

PROC3:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---------------------------------|--|------------------------|-------|------------------------|---------|
| inhalative, long-term, systemic | Indoor use, with local exhaust ventilation | 11,7 mg/m ³ | 0,509 | ECETOC TRA, EUSES v2.1 | none |

PROC3:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---|--|------------------------|-----|------------------------|---------|
| inhalative, short-term, systemic, (acute) | Indoor use, with local exhaust ventilation | 23,4 mg/m ³ | 0,2 | ECETOC TRA, EUSES v2.1 | none |

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES



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Check that RMMs and OCs are as described above or of equivalent efficiency Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see <http://www.ecetoc.org/tra>

Exposure Scenario 5.

Exposure Scenario worker

1. Using gas as feedstock in chemical processes., Industrial use

| List of use descriptors | |
|--------------------------|------------------------------------|
| Sector(s) of use | SU9: Manufacture of fine chemicals |
| Product categories [PC]: | PC21: Laboratory chemicals |

| | |
|---|---|
| Name of contributing environmental scenario and corresponding ERC | <u>Using gas as feedstock in chemical processes.:</u> ERC6a: Use of intermediate |
|---|---|

| | |
|------------------------|---|
| Contributing Scenarios | <u>Using gas as feedstock in chemical processes.:</u> PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities |
|------------------------|---|

2.1. Contributing exposure scenario controlling environmental exposure for: Using gas as feedstock in chemical processes., Industrial use

Product characteristics

| | |
|--|---|
| Concentration of the substance in a mixture: | Covers percentage substance in the product up to 100 %. |
|--|---|

| | |
|------------------------------|---------------------------|
| Physical form of the product | See section 9 of the SDS. |
|------------------------------|---------------------------|

| | |
|----------------------|--------------------|
| Viscosity: | |
| Kinematic viscosity: | No data available. |
| Dynamic viscosity: | No data available. |



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Amounts used

The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release

Frequency and duration of use

| | |
|---------------------|-------------------|
| Batch process: | 220 Emission days |
| Continuous process: | not relevant |

Environment factors not influenced by risk management

Other given operational conditions affecting environmental exposure

| | |
|---------------------------------------|--------------|
| Other relevant operational conditions | not relevant |
|---------------------------------------|--------------|

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

| | |
|-----------|---|
| Air | Handle substance within a closed system. Effectiveness: 100 %. |
| Soil | not relevant |
| Water | not relevant |
| Sediment: | not relevant |
| Remarks: | not relevant |

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

| | |
|-------|--------------|
| type: | not relevant |
|-------|--------------|



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| | |
|----------------------------------|--|
| Discharge rate: | not relevant |
| Treatment effectiveness: | not relevant |
| Sludge treatment technique: | not relevant |
| Measures to limit air emissions: | not relevant |
| Remarks: | Wastewater emission controls are not applicable as there is no direct release to wastewater. |

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

| Suitable waste treatment | Treatment effectiveness | Remarks |
|---------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

| Suitable recovery operations: | Treatment effectiveness | Remarks |
|-------------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Additional good practice advice beyond the REACH Chemical Safety Report

Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Using gas as feedstock in chemical processes., Industrial use

| | |
|---------------------|--|
| Process Categories: | PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities |
|---------------------|--|

Product characteristics

| | |
|--|---|
| Concentration of the substance in a mixture: | Covers percentage substance in the product up to 100 %. |
| Physical form of the product: | See section 9 of the SDS. |
| Vapour pressure: | > 101,325 kPa |



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| | |
|----------------------|-----------------------------------|
| Process temperature: | $\geq 20\text{ }^{\circ}\text{C}$ |
| Remarks | not relevant |

Amounts used

The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release

Frequency and duration of use

| | Use duration: | Frequency of use: | Remarks |
|-----------------|---------------|-------------------|---------|
| Hours per shift | 8 h | 5 days per week | |

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Other relevant operational conditions: . See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|--|-----------------|--------------|---------------|--|
| Provide a basic standard of general ventilation (1 to 3 air changes per hour). | | | | Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions |
| Provide a basic standard of general ventilation (1 to 3 air changes per hour). | | | | Transfer of substance or mixture (charging and discharging) at dedicated facilities |



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| | | | | |
|---------------------------|--|--|--|---|
| hour). | | | | |
| Local exhaust ventilation | | | | Transfer of substance or mixture (charging and discharging) at dedicated facilities |

Organisational measures to prevent/limit releases, dispersion and exposure

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------------|-----------------|--------------|---------------|---------|
| See section 7 of the SDS. | | | | |

Conditions and measures related to personal protection, hygiene and health evaluation

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------|-----------------|--------------|---------------|--|
| | | | | See section 8 of the safety data sheet (Personal protection equipment) |

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system Apply a good standard of general or controlled ventilation when maintenance activities are carried out. Ensure operatives are trained to minimise exposure Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed

3. Exposure estimation

Environment:

Using gas as feedstock in chemical processes., Industrial use:

ERC6a:

| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|------------------------|----------------|
| Air | | < 1 | ECETOC TRA, EUSES v2.1 | Closed systems |

ERC6a:

| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|-------------------|--------------------------|
| Water | | < 1 | ECETOC TRA, EUSES | The exposure of aquatic, |



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| | | | | |
|--|--|--|------|---|
| | | | v2.1 | terrestrial, sediment and sewage treatment microorganisms is considered to be negligible because the substance partitions primarily to air when released to the environment. The resulting environmental exposure is not expected to add significantly to already present background levels of the gas in the environment |
|--|--|--|------|---|

Health:

Using gas as feedstock in chemical processes., Industrial use:

PROC1:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---------------------------------|---|-------------------------|---------|------------------------|---------|
| inhalative, long-term, systemic | Indoor use, without local exhaust ventilation | 0,011 mg/m ³ | < 0,001 | ECETOC TRA, EUSES v2.1 | none |

PROC1:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---|---|-------------------------|----------|------------------------|---------|
| inhalative, short-term, systemic, (acute) | Indoor use, without local exhaust ventilation | 0,023 mg/m ³ | <= 0,001 | ECETOC TRA, EUSES v2.1 | none |

PROC8b:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---------------------------------|--|------------------------|-------|------------------------|---------|
| inhalative, long-term, systemic | Indoor use, with local exhaust ventilation | 17,5 mg/m ³ | 0,761 | ECETOC TRA, EUSES v2.1 | none |

PROC8b:



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| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---|--|----------------------|-------|------------------------|---------|
| inhalative, short-term, systemic, (acute) | Indoor use, with local exhaust ventilation | 35 mg/m ³ | 0,299 | ECETOC TRA, EUSES v2.1 | none |

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

Check that RMMs and OCs are as described above or of equivalent efficiency. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see <http://www.ecetoc.org/tra>

Exposure Scenario 6.

Exposure Scenario worker

1. Using gas alone or in mixtures for the calibration of analysis equipment., Professional use

| List of use descriptors | |
|--------------------------|---|
| Sector(s) of use | SU24: Scientific research and development |
| Product categories [PC]: | PC21: Laboratory chemicals |

| | |
|---|---|
| Name of contributing environmental scenario and corresponding ERC | <u>Using gas alone or in mixtures for the calibration of analysis equipment.:</u> ERC8a: Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor) |
|---|---|

| | |
|------------------------|--|
| Contributing Scenarios | <u>Using gas alone or in mixtures for the calibration of analysis equipment.:</u> PROC15: Use as laboratory reagent |
|------------------------|--|

2.1. Contributing exposure scenario controlling environmental exposure for: Using gas alone or in mixtures for the calibration of analysis equipment., Professional use

Product characteristics

| | |
|--|---|
| Concentration of the substance in a mixture: | Covers percentage substance in the product up to 100 %. |
|--|---|



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| | |
|------------------------------|---------------------------|
| Physical form of the product | See section 9 of the SDS. |
|------------------------------|---------------------------|

| | |
|----------------------|--------------------|
| Viscosity: | |
| Kinematic viscosity: | No data available. |
| Dynamic viscosity: | No data available. |

Amounts used

| |
|--|
| The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release |
|--|

Frequency and duration of use

| | |
|---------------------|-------------------|
| Batch process: | 220 Emission days |
| Continuous process: | not relevant |

Environment factors not influenced by risk management

Other given operational conditions affecting environmental exposure

| | |
|---------------------------------------|--------------|
| Other relevant operational conditions | not relevant |
|---------------------------------------|--------------|

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

| |
|---|
| See section 8 of the safety data sheet (Environmental exposure controls). |
|---|

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

| | |
|-----------|---|
| Air | Handle substance within a closed system. Effectiveness: 100 %. |
| Soil | not relevant |
| Water | not relevant |
| Sediment: | not relevant |
| Remarks: | not relevant |



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Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

| | |
|----------------------------------|--|
| type: | not relevant |
| Discharge rate: | not relevant |
| Treatment effectiveness: | not relevant |
| Sludge treatment technique: | not relevant |
| Measures to limit air emissions: | not relevant |
| Remarks: | Wastewater emission controls are not applicable as there is no direct release to wastewater. |

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

| Suitable waste treatment | Treatment effectiveness | Remarks |
|---------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

| Suitable recovery operations: | Treatment effectiveness | Remarks |
|-------------------------------|-------------------------|---------|
| See section 13 of the SDS | | |

Additional good practice advice beyond the REACH Chemical Safety Report

Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Using gas alone or in mixtures for the calibration of analysis equipment., Professional use

Process Categories: PROC15: Use as laboratory reagent

Product characteristics

Concentration of the substance in a mixture: Covers percentage substance in the product up to 100 %.



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| | |
|-------------------------------|---------------------------|
| Physical form of the product: | See section 9 of the SDS. |
| Vapour pressure: | > 101,325 kPa |
| Process temperature: | >= 20 °C |
| Remarks | not relevant |

Amounts used

The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release

Frequency and duration of use

| | Use duration: | Frequency of use: | Remarks |
|-----------------|---------------|-------------------|---------|
| Hours per shift | 8 h | 5 days per week | |

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Other relevant operational conditions: . See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|--|-----------------|--------------|---------------|---------------------------|
| Provide a basic standard of general ventilation (1 to 3 air changes per hour). | | | | Use as laboratory reagent |
| Local exhaust | | | | Use as laboratory reagent |



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| | | | | |
|-------------|--|--|--|--|
| ventilation | | | | |
|-------------|--|--|--|--|

Organisational measures to prevent/limit releases, dispersion and exposure

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------------|-----------------|--------------|---------------|---------|
| See section 7 of the SDS. | | | | |

Conditions and measures related to personal protection, hygiene and health evaluation

| inhalation exposure | dermal exposure | eye exposure | oral exposure | Remarks |
|---------------------|-----------------|--------------|---------------|--|
| | | | | See section 8 of the safety data sheet (Personal protection equipment) |

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system Apply a good standard of general or controlled ventilation when maintenance activities are carried out. Ensure operatives are trained to minimise exposure Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed

3. Exposure estimation

Environment:

Using gas alone or in mixtures for the calibration of analysis equipment., Professional use:

ERC8a:

| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|------------------------|----------------|
| Air | | < 1 | ECETOC TRA, EUSES v2.1 | Closed systems |

ERC8a:

| Compartment | PEC | RCR | Method | Remarks |
|-------------|-----|-----|------------------------|---|
| Water | | < 1 | ECETOC TRA, EUSES v2.1 | The exposure of aquatic, terrestrial, sediment and sewage treatment microorganisms is considered to be negligible because the substance |



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| | | | | |
|--|--|--|--|--|
| | | | | partitions primarily to air when released to the environment. The resulting environmental exposure is not expected to add significantly to already present background levels of the gas in the environment |
|--|--|--|--|--|

Health:

Using gas alone or in mixtures for the calibration of analysis equipment., Professional use:

PROC15:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---------------------------------|--|--------------------------|--------|------------------------|---------|
| inhalative, long-term, systemic | Indoor use, with local exhaust ventilation | 0,0117 mg/m ³ | 0,0005 | ECETOC TRA, EUSES v2.1 | none |

PROC15:

| Route of Exposure | Specific condition | Exposure level | RCR | Method | Remarks |
|---|--|--------------------------|--------|------------------------|---------|
| inhalative, short-term, systemic, (acute) | Indoor use, with local exhaust ventilation | 0,0234 mg/m ³ | 0,0002 | ECETOC TRA, EUSES v2.1 | none |

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

Check that RMMs and OCs are as described above or of equivalent efficiency Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see <http://www.ecetoc.org/tra>