Safety Data Sheet

Carbon monoxide

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878
Referentni broj: RS-CO-019
Issue date: 01/01/2016 Revision date: 01/01/2026 Supersedes: 09/01/2024 Version: 3C

Danger

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

1.1. Product identifier

Trade name	:	Carbon monoxide 4.7
SDS no	:	RS-CO-019
Other means of identification		
CAS no.	:	630-08-0
EC no.	:	211-128-3
Index no.	:	006-001-00-2
REACH no.	:	01-2119480165-39
Chemical formula	:	CO

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

Relevant identified uses	:	See the list of identified uses and exposure scenarios in the annex of the safety data sheet. Industrial and professional uses. Perform risk assessment prior to use.
Uses advised against	:	Consumer use. Uses other than those listed above are not supported, contact your supplier for more information on other uses.

1.3. Details of the supplier of the safety data sheet

Messer Tehnogas AD Beograd
Banjicki put no. 62
11090 Belgrade, Serbia
Telephone: +381 11 35 37 200 Fax: +381 11 35 37 291
e-mail: postoffice@messer.rs
Web: www.messer.rs

Person responsible for the safety data sheet:
Tamara Ječmenica, Chemicals Advisor
Telephone: +381 65 35 37 785
e-mail: sds@messer.rs

1.4. Emergency telephone number

Emergency telephone number	:	Poison Control Center, VMA Crnotravska 17, Belgrade Serbia Tel. : +381(0) 11 360 8440 (24h)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Physical hazards	Flammable gases, Category 1B	H221
	Gases under pressure : Compressed gas	H280
Health hazards	Acute toxicity (inhalation:gas) Category 3*	H331

Reproductive toxicity, Category 1A	H360D ***
Specific target organ toxicity – Repeated exposure, Category 1	H372 **

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP) :

GHS02 GHS04 GHS06 GHS08

Signal word (CLP) : Danger

Hazard statements (CLP) : H221 - 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 (CLP)

- Prevention : P201 - Obtain special instructions before use.
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, vapours.
P264 - Wash exposed body parts thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P271 - Use only outdoors or in a well-ventilated area.
P281 - Use personal protective equipment as required.

- Response : P304+P340 - IF INHALED : Remove person to fresh air and keep comfortable for breathing.
P308+P313 - IF exposed or concerned: Get medical advice/attention.
P311 - Call a POISON CENTER or doctor.
P321 - Specific treatment.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - In case of leakage, eliminate all ignition sources.

- Storage : P403+P410+P233 - Protect from sunlight. Store in a well-ventilated place. Keep container tightly closed.
P405 - Store locked up.

- Disposal : P501 - Dispose of container in accordance with local, regional, national and/or international regulation.

Supplemental information : Restricted to professional users.

2.3. Other hazards

Not classified as PBT or vPvB. Not classified as PMT or vPvM.
The substance/mixture has no endocrine disrupting properties.
The toxic effect occurs very quickly even at extremely low concentrations.
The lethal dose of CO for humans is (1000-2000) ppm, (0.1 – 0.2)% when breathing the gas for 30 minutes. High concentrations of carbon monoxide in inhaled air, death can occur within 1-2 minutes of inhalation.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP] ATE, EUH-statements, M-Factors
Carbon monoxide	CAS no.: 630-08-0 EC no.: 211-128-3 Index no.: 006-001-00-2 REACH no.: 01-2119480165-39	≤ 100	Flam. Gas 1B, H221 Press. Gas (Comp.), H280 Acute Tox. 3 (Inhalation:gas), H331 Repr. 1A, H360D *** STOT RE 1, H372 **

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

- Inhalation : Provide oxygen. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor.
  Perform cardiopulmonary resuscitation if breathing stopped.
- Skin contact : Adverse effects not expected from this product.
- Eye contact : Adverse effects not expected from this product.
- Ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms may include dizziness, headache, nausea and loss of co-ordination.
Delayed adverse effects possible. See section 11.

4.3. Indication of any immediate medical attention and special treatment needed

Take first aid measures. Loosen tight clothing, such as a collar, tie or belt.
Place the unconscious person in a lateral position. Seek medical attention.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Water spray or fog. Dry powder. Carbon dioxide.
  Shutting off the source of the gas is the preferred method of control.
  Be aware of the risk of formation of static electricity with the use of CO_2 extinguishers.
  Do not use them in places where a flammable atmosphere may be present.
- Unsuitable extinguishing media : Do not use water jet to extinguish.

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 that are more hazardous than the product itself.

5.3. Advice for firefighters

Specific methods	:	Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems. If possible, stop flow of product. Use water spray or fog to knock down fire fumes if possible. Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire. Move containers away from the fire area if this can be done without risk.
Special protective equipment for fire fighters	:	Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. Standard EN 943-2: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Gas-tight chemical protective suits for emergency teams. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	:	Act in accordance with local emergency plan. Try to stop release. Evacuate area. Eliminate ignition sources. Ensure adequate air ventilation. Stay upwind. See section 8 of the SDS for more information on personal protective equipment.
For emergency responders	:	Monitor concentration of released product. Consider the risk of potentially explosive atmospheres. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. See section 5.3 of the SDS for more information.

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

Safe use of the product	:	Avoid exposure, obtain special instructions before use. Assess the risk of potentially explosive atmospheres and the need for explosion-proof equipment. Ensure equipment is adequately earthed. Take precautionary measures against static discharge. Keep away from ignition sources (including static discharges). Consider the use of only non-sparking tools. Consider the use of flash back arrestors. Installation of a cross purge assembly between the container and the regulator is recommended. The product must be handled in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke while working with the product. Wash hands after use. Only experienced and properly instructed persons should handle gases under pressure.

Wear personal protective equipment (See section 8).
Avoid using pure nickel. Corrosion of pure nickel in carbon monoxide atmospheres occurs even at room temperature.
Ensure that there is a suitable ventilation system. Purge air from system before introducing gas.
Consider pressure relief device(s) in gas installations.
Ensure the complete gas system was (or is regularily) checked for leaks before use.
Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt.
Avoid suck back of water, acid and alkalis.
Do not breathe gas.
Avoid release of product into work area.

Safe handling of the gas receptacle : Refer to supplier's container handling instructions.
Protect containers from physical damage; do not drag, roll, slide or drop.
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.
If the protection cap is too tight, remove it with adjustable wrench.
Never insert sharp objects into the cavities of the cap, this can lead to damage to the valve and leakage.
Open valve slowly to avoid pressure shock. If user experiences any difficulty operating valve discontinue use and contact supplier. Never attempt to repair or modify container valves or safety relief devices.
Damaged valves should be reported immediately to the supplier.
Keep container valve outlets clean and free from contaminants particularly oil and water. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
Close container valve after each use and when empty, even if still connected to equipment.
Never attempt to transfer gases from one cylinder/container to another.
Never use direct flame or electrical heating devices to raise the pressure of a container.
Do not allow backfeed into the container. Suck back of water into the container must be prevented.
Do not remove or deface labels provided by the supplier for the identification of the content of the container.

7.2. Conditions for safe storage, including any incompatibilities

Segregate from oxidant gases and other oxidants in store.
All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere. Observe all regulations and local requirements regarding storage of containers. Containers should not be stored in conditions likely to encourage corrosion.
Container valve guards or caps should be in place.
Containers should be stored in the vertical position and properly secured to prevent them from falling over.
Stored containers should be periodically checked for general condition and leakage.
Keep container below 50°C in a well ventilated place.
Store containers in location free from fire risk and away from sources of heat and ignition.
Keep away from combustible materials.
Store locked up.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Carbon monoxide (630-08-0)	
EU - Binding Occupational Exposure Limit (BOEL)	
Local name	Carbon monoxide
BOEL TWA	23 mg/m³
	20 ppm
BOEL STEL	117 mg/m³
	100 ppm
Regulatory reference	DIRECTIVE (EU) 2022/431 (amending Directive 2004/37/EC)
Serbia - Occupational Exposure Limits	
Local name	угљенмоноксид
OEL TWA	23 mg/m³
	20 ppm
OEL STEL	117 mg/m³
	100 ppm
Remark	ЕУ**** – напомена да се ради о хемијским материјама за које су утврђене индикативне граничне вредности изложености према Директиви 2017/164/ЕУ (четврта листа)
Regulatory reference	ПРАВИЛНИК о превентивним мерама за безбедан и здрав рад при излагању хемијским материјама („Службени гласник РС”, бр. 106/09, 117/17 и 107/21)

Carbon monoxide (630-08-0)	
DNEL: Derived no effect level (Workers)	
Acute - local effects, inhalation	117 ppm
Acute - systemic effects, inhalation	117 mg/m³
Long-term - local effects, inhalation	23 ppm
Long-term - systemic effects, inhalation	23 mg/m³

PNEC (Predicted No-Effect Concentration) : None established.

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Product to be handled in a closed system and under strictly controlled conditions.
Provide adequate general and local exhaust ventilation.
Preferably use permanent leak-tight installations (e.g. welded pipes).
Systems under pressure should be regularly checked for leakages.
Ensure exposure is below occupational exposure limits (where available).
Gas detectors should be used when toxic gases may be released.
Consider the use of a work permit system e.g. for maintenance activities.

8.2.2. Individual protection measures, e.g. personal protective equipment

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:
PPE compliant to the recommended EN/ISO standards should be selected.

• Eye/face protection : Wear safety glasses with side shields.
Standard EN 166 - Personal eye-protection - specifications.
Standard EN ISO 16321-1 - Eye and face protection for occupational use Part 1: General requirements.

• Skin protection

- Hand protection : Wear working gloves when handling gas containers.
Standard EN 388 - Protective gloves against mechanical risks, performance level 1 or higher.
Recommended types include wrist gloves from leather or synthetic material with equivalent performance, fabric gloves, fabric gloves with leather palms.

- Other : Consider the use of flame resistant anti-static safety clothing.
Standard EN ISO 14116 - Limited flame spread materials.
Standard EN 1149-5 - Protective clothing: Electrostatic properties.
Wear safety shoes while handling containers.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

• Respiratory protection : Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmospheres.
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.
Keep self contained breathing apparatus readily available for emergency use.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.
Consult respiratory device supplier´s product information for the selection of the appropriate device.

• Thermal hazards : None in addition to the above sections.

8.2.3. 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

Appearance		
- Physical state at 20°C / 101.3kPa	:	Gas.
- Colour	:	Colourless.
Odour	:	Odourless.
Melting point / Freezing point	:	-205 °C
Boiling point	:	-191.5 °C
Flammability	:	Flammable gas.
Lower explosion limit	:	10.9 vol %
Upper explosion limit	:	76 vol %
Flash point	:	Not applicable for gases and gas mixtures.
Auto-ignition temperature	:	620 °C
Decomposition temperature	:	Not applicable.
pH	:	Not applicable for gases and gas mixtures.
Viscosity, kinematic	:	No reliable data available.
Water solubility [20°C]	:	30 mg/l
Partition coefficient n-octanol/water (Log K_{ow})	:	1.78
Vapour pressure [20°C]	:	Not applicable.
Vapour pressure [50°C]	:	Not applicable.
Density and/or relative density	:	Not applicable for gases and gas mixtures.
Relative vapour density (air=1)	:	1
Particle characteristics	:	Not applicable for gases and gas mixtures. Nanoforms are not relevant for gases and gas mixtures.

9.2. Other information

9.2.1. Information with regard to physical hazard classes

Explosion limits	:	Not known.
Oxidising properties	:	No oxidising properties.
Tci	:	15.2 %
Critical temperature [°C]	:	-140 °C

9.2.2. Other safety characteristics

Molar mass	:	28 g/mol

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Can form explosive mixture with air.
May react violently with oxidants.

10.4. Conditions to avoid

Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Avoid moisture in installation systems.

10.5. Incompatible materials

Air, Oxidisers.
For additional information on compatibility refer to ISO 11114.
See also 'EIGA Doc.95/21: Avoidance of Failure of CO and of CO/CO_2 Mixtures Cylinders' at www.eiga.eu

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 hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity : Toxic if inhaled.

carbon monoxide (630-08-0)	
LC50 Inhalation - Rat [ppm]	3760 ppm/1h (ADR) 1300 ppm/4h (CLP)

Skin corrosion/irritation : No known effects from this product.

Serious eye damage/irritation : No known effects from this product.

Respiratory or skin sensitisation : No known effects from this product.

Germ cell mutagenicity : No known effects from this product.

Carcinogenicity : No known effects from this product.

Toxic for reproduction : Fertility : No known effects from this product.

Toxic for reproduction : unborn child : May damage the unborn child.

STOT-single exposure : Suppresses the oxygen uptake by red blood cells.

Target organ(s) : Blood.

STOT-repeated exposure : Causes damage to organs through prolonged or repeated exposure.

Target organ(s) : Heart.

Aspiration hazard : Not applicable for gases and gas mixtures.

11.2. Information on other hazards

Other information : The substance / mixture has no endocrine disrupting properties.

SECTION 12: Ecological information

12.1. Toxicity

Assessment : No ecological damage caused by this product.

EC50 48h - Daphnia magna [mg/l] : No data available.

EC50 72h - Algae [mg/l] : No data available.

LC50 96 h - Fish [mg/l] : No data available.

12.2. Persistence and degradability

Assessment : Will not undergo hydrolysis. Not readily biodegradable.

12.3. Bioaccumulative potential

Assessment : Not expected to bioaccumulate due to the low log K_{ow} (log K_{ow} < 4).
See Section 9.

12.4. Mobility in soil

Assessment : Because of its high volatility, the product is unlikely to cause ground or water pollution.
Partition into soil is unlikely.

12.5. Results of PBT and vPvB assessment

Assessment : Not classified as PBT or vPvB.

12.6. Endocrine disrupting properties

Assessment : The substance / mixture has no endocrine disrupting properties.

12.7. Other adverse effects

Other adverse effects : Not classified as PMT or vPvM.

Effect on the ozone layer : No effect on the ozone layer.

Effect on global warming : No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Contact supplier if guidance is required.
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.
Ensure that the emission levels from local regulations or operating permits are not exceeded.
Refer to the EIGA code of practice Doc.30/21 "Disposal of Gases", downloadable at http://www.eiga.eu for more guidance on suitable disposal methods.
Must not be discharged to atmosphere.
Return unused product in original container to supplier.

List of hazardous waste codes (from Commission Delegated Decision (EU) 2025/934 of 5 March 2025 amending Decision 2000/532/EC) : 16 05 04 *: Gases in pressure containers (including halons) containing hazardous substances.

13.2. Additional information

External treatment and disposal of waste should comply with applicable local and/or national regulations.

SECTION 14: Transport information

14.1. UN number or ID number

In accordance with ADR / RID / IMDG / IATA / ADN

UN-No. : 1016

14.2. UN proper shipping name

Transport by road/rail/inland waterways (ADR/RID/ADN)	:	CARBON MONOXIDE, COMPRESSED
Transport by air (ICAO-TI / IATA-DGR)	:	Carbon monoxide, compressed
Transport by sea (IMDG)	:	CARBON MONOXIDE, COMPRESSED

14.3. Transport hazard class(es)

Labelling :

2.3 : Toxic gases.

2.1 : Flammable gases.

Transport by road/rail/inland waterways (ADR/RID/ADN)

Class	:	2
Classification code	:	1TF
Hazard identification number	:	263
Tunnel Restriction	:	B/D - Tank carriage: Passage forbidden through tunnels of category B, C, D and E. Other carriage: Passage forbidden through tunnels of category D and E

Transport by sea (IMDG)

Class / Div. (Sub. risk(s))	:	2.3 (2.1)
Emergency Schedule (EmS) - Fire	:	F-D
Emergency Schedule (EmS) - Spillage	:	S-U

14.4. Packing group

Transport by road/rail/inland waterways (ADR/RID/ADN)	:	Not applicable.
Transport by air (ICAO-TI / IATA-DGR)	:	Not applicable.
Transport by sea (IMDG)	:	Not applicable.

14.5. Environmental hazards

Transport by road/rail/inland waterways (ADR/RID/ADN)	:	None.
Transport by air (ICAO-TI / IATA-DGR)	:	None.
Transport by sea (IMDG)	:	None.

14.6. Special precautions for user

Packing Instruction(s)

Transport by road/rail/inland waterways (ADR/RID/ADN)	:	P200.
Transport by air (ICAO-TI / IATA-DGR)		
Passenger and Cargo Aircraft	:	Forbidden.
Cargo Aircraft only	:	Forbidden.
Transport by sea (IMDG)	:	P200.

Special transport precautions : 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 there is adequate ventilation.
- Ensure that containers are firmly secured.
- Ensure valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.

14.7. Maritime transport in bulk according to IMO instruments

Not applicable.

SECTION 15: Regulatory information

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

RS Regulations

Pravilnik o ograničenjima i zabranama proizvodnje, stavljanja u promet i korišćenja hemikalija("Sl. glasnik RS", br. 90/13, 25/15, 2/16, 44/17, 36/18, 9/20, 57/22, 29/24 i 90/25) : Allowed for professional use only.
Prohibition 30.

Pravilnik o izvozu i uvozu određenih opasnih hemikalija („Sl. glasnik RS“ br. 93/23 i 78/25) : None.

Zakon o kontroli opasnosti od velikih udesa koji uključuju opasne supstance ("Sl. glasnik RS", br. 94/24) : Covered.

Pravilnik o Listi opasnih supstanci, vrstama i količinama opasnih supstanci i kriterijumima za razvijanje kompleksa u kompleksu nižeg reda i kompleksa višeg reda ("Sl. glasnik RS", br. 28/25)	Qualifying quantity (tonnes)	
	Lower-tier	Upper-tier
H2 ACUTE TOXIC — Category 2, all exposure routes — Category 3, inhalation exposure route	50	200
P2 FLAMMABLE GASES Flammable gases, Category 1 or 2	10	50

EU Regulations

Other information, restriction and prohibition regulations : Restricted to professional users (Annex XVII REACH). Entry 30.
Not listed on the PIC list (Regulation EU 649/2012).
Not listed on the POP list (Regulation EU 2019/1021).

Seveso Directive : 2012/18/EU (Seveso III) : Covered.

Seveso III Part I (Categories of dangerous substances)	Qualifying quantity (tonnes)	
	Lower-tier	Upper-tier
H2 ACUTE TOXIC — Category 2, all exposure routes — Category 3, inhalation exposure route	50	200
P2 FLAMMABLE GASES Flammable gases, Category 1 or 2	10	50

15.2. Chemical safety assessment

A CSA has been carried out.

SECTION 16: Other information

Indication of changes : In Section 1, the Safety Data Sheet is supplemented with information about details of the supplier of the safety data sheet.
In Section 2, the Safety Data Sheet is supplemented with other hazards.
In Section 8, the Safety Data Sheet is supplemented with information about personal protection.
In Section 12, the Safety Data Sheet is supplemented with other adverse effects.
In Section 13, the Safety Data Sheet is supplemented with information about waste treatment methods.
In Section 15, the Safety Data Sheet is supplemented with regulatory information.

Abbreviations and acronyms : ADN - International Carriage of Dangerous Goods by Inland Waterways
ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE - Acute Toxicity Estimate
CAS - Chemical Abstract Service number
CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
CSA - Chemical Safety Assessment
DNEL - Derived No Effect Levels
EINECS - European Inventory of Existing Commercial Chemical Substances
EC- European Community number
EIGA - European Industrial Gases Association
EN - European Standard
IATA - International Air Transport Association
ICAO - International Civil Aviation Organization
IMDG - International Maritime Dangerous Goods
IMO - International Maritime Organization
LC50 - Lethal Concentration to 50 % of a test population
LD50 - Lethal Dose 50%
LEL - Lower Explosive Limit
OEL - Occupational exposure limits
PBT - Persistent, Bioaccumulative and Toxic
PMT - Perzistentno, mobilno i toksično .
PNEC - Predicted No Effect Concentration
PPE - Personal Protection Equipment
PROC - Procesna kategorija (Process category).
REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
RID - Regulations concerning the International Carriage of Dangerous Goods by Rail
RMM - Risk Management Measures
STOT - RE - Specific Target Organ Toxicity - Repeated Exposure
STOT- SE - Specific Target Organ Toxicity - Single Exposure
STEL - Short Term Exposure Limit
TWA –8-hour total weight average
UEL - Upper explosive limit
UFI - Unique Formula Identifier
UN - United Nations

vPvB - Very Persistent and Very Bioaccumulative

vPvM – veoma perzistentno i veoma mobilno.

WGK - Water Hazard Class

Training advice : Receptacle under pressure.
Ensure operators understand the flammability hazard.
Ensure operators understand the toxicity hazard.

Further information : Classification in accordance with the procedures and calculation methods of Regulation (EC) 1272/2008 (CLP). Key literature references and sources of data are maintained in EIGA doc 169 : 'Classification and Labelling Guide', downloadable at http://www.eiga.eu

Full text of H- and EUH-statements	
Acute Tox. 3* (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 3*
Flam. Gas 1B	Flammable gases, Category 1B
H221	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.
Press. Gas (Comp.)	Gases under pressure : Compressed gas
Repr. 1A	Reproductive toxicity, Category 1A
STOT RE 1	Specific target organ toxicity – Repeated exposure, Category 1

DISCLAIMER OF LIABILITY : Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.
Details given in this document are believed to be correct at the time of going to press.
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.

End of Safety Data Sheet

Annex to the safety data sheet

This Annex documents the Exposure Scenarios (ESs) related to the identified uses of the registered substance. The ESs detail protective measures for workers and the environment in addition to those described in sections 7, 8, 11, 12 and 13 of the SDS that are required to ensure that the potential exposure to workers and the environment remains within acceptable levels for each of the identified uses.

Table of contents of the Annex

1. EIGA019-1: Industrial uses, closed contained conditions

1.1. Title section

	Industrial uses, closed contained conditions	
	ES Ref.: EIGA019-1 Revision date: 9/1/2016	

Processes, tasks, activities covered	Industrial uses, including product transfers and associated laboratory activities within different closed or contained systems

Environment	Use descriptors
CS1	ERC2, ERC6a, ERC6b, ERC8d

Worker	Use descriptors
CS2	PROC1
CS3	PROC2
CS4	PROC3, PROC4
CS5	PROC8b
CS6	PROC9

Assessment method	ECETOC TRA 2.0

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: ERC2, ERC6a, ERC6b, ERC8d

ERC2	Formulation into mixture
ERC6a	Use of intermediate
ERC6b	Use of reactive processing aid at industrial site (no inclusion into or onto article)
ERC8d	Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor)

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
The actual tonnage handled per site is not considered to influence the immissions as such for this scenario as there is practically no release	
Covers frequency up to:	5 days/week
Emission Days (days/year)	220

Technical and organisational conditions and measures
Wastewater emission controls are not applicable as there is no direct release to wastewater
Soil emission controls are not applicable as there is no direct release to soil
Ensure operatives are trained to minimise releases

Conditions and measures related to sewage treatment plant
Not applicable as there is no release to wastewater

Conditions and measures related to treatment of waste (including article waste)
External treatment and disposal of waste should comply with applicable local and/or national regulations
See section 13 of the SDS

Other conditions affecting environmental exposure
No additional information

1.2.2. Control of worker exposure: PROC1

PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures
Handle product within a closed system
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.
See sections 2 and 7 of the SDS.
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

Conditions and measures related to personal protection, hygiene and health evaluation
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.
See section 8 of the SDS.

Other conditions affecting workers exposure
Indoor or outdoor use

1.2.3. Control of worker exposure: PROC2

PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures
Handle product within a closed system
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.
Ensure samples are obtained under containment or extract ventilation.

Drain down and flush system prior to equipment break-in or maintenance.
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.
See sections 2 and 7 of the SDS.
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

Conditions and measures related to personal protection, hygiene and health evaluation
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.
See section 8 of the SDS.

Other conditions affecting workers exposure
Indoor or outdoor use

1.2.4. Control of worker exposure: PROC3, PROC4

PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
PROC4	Chemical production where opportunity for exposure arises

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures
Handle product within a closed system
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.
Ensure samples are obtained under containment or extract ventilation.
Drain down and flush system prior to equipment break-in or maintenance.

Apply a good standard of general or controlled ventilation when maintenance activities are carried out.
See sections 2 and 7 of the SDS.
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

Conditions and measures related to personal protection, hygiene and health evaluation
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.
See section 8 of the SDS.

Other conditions affecting workers exposure
Indoor or outdoor use

1.2.5. Control of worker exposure: PROC8b

PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures
Handle product within a closed system
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.
Fill containers at dedicated fill points supplied with local extract ventilation.
Ensure samples are obtained under containment or extract ventilation.
Drain down and flush system prior to equipment break-in or maintenance.

Apply a good standard of general or controlled ventilation when maintenance activities are carried out.
See sections 2 and 7 of the SDS.
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

Conditions and measures related to personal protection, hygiene and health evaluation
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.

Other conditions affecting workers exposure
Indoor or outdoor use

1.2.6. Control of worker exposure: PROC9

PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures
Handle product within a closed system
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.
Fill containers at dedicated fill points supplied with local extract ventilation.
Ensure samples are obtained under containment or extract ventilation.
Drain down and flush system prior to equipment break-in or maintenance.
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.

See sections 2 and 7 of the SDS.
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

Conditions and measures related to personal protection, hygiene and health evaluation
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.

Other conditions affecting workers exposure
Indoor or outdoor use

1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure: ERC2, ERC6a, ERC6b, ERC8d

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

1.3.2. Worker exposure: PROC1

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Inhalation - Long-term - systemic effects	0.011 mg/m³	Indoor use, Without LEV	< 0.001
Inhalation - Acute - systemic effects	0.023 mg/m³	Indoor use, Without LEV	≤ 0.001

1.3.3. Worker exposure: PROC2

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Inhalation - Long-term - systemic effects	5.84 mg/m³	Indoor use, With LEV	0.254
Inhalation - Acute - systemic effects	11.7 mg/m³	Indoor use, With LEV	0.1

1.3.4. Worker exposure: PROC3, PROC4

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Inhalation - Long-term - systemic effects	11.7 mg/m³	Indoor use, With LEV	0.509
Inhalation - Acute - systemic effects	23.4 mg/m³	Indoor use, With LEV	0.2

1.3.5. Worker exposure: PROC8b

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Inhalation - Long-term - systemic effects	17.5 mg/m³	Indoor use, With LEV	0.761

Inhalation - Acute - systemic effects	35 mg/m³	Indoor use, With LEV	0.299

1.3.6. Worker exposure: PROC9

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Inhalation - Long-term - systemic effects	0.025 mg/m³	Measured value	0.001
Inhalation - Acute - systemic effects	46.6 mg/m³	Indoor use, With LEV	0.398

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

1.4.1. Environment

Guidance - Environment	Check that RMMs and OCs are as described above or of equivalent efficiency

1.4.2. Health

Guidance - Health	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

End of document