

Carbon dioxide (refrigerated)

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878 Reference number: RS-CO2-018B Issue date: 02/01/2019 Revision date: 09/01/2024 Supersedes: 09/01/2023 Version: 3C

Warning



SECTION 1: Identification of the substance/mixture and of the company/undertaking		
1.1. Product identifier		
Trade name	: Carbon dioxide (refrigerated)	
SDS no	: RS-CO2-018B	
Other means of identification		
CAS no.	: 124-38-9	
EC no.	: 204-696-9	
Index no.	:	
REACH no.	: Listed in Annex IV / V REACH, exempted from registration.	
Chemical formula	: CO ₂	
1.2. Relevant identified uses of the substance	or mixture and uses advised against	
Relevant identified uses	 Industrial and professional uses. Perform risk assessment prior to use. Test gas / Calibration gas. Shield gas for welding processes. Purge gas, diluting gas, inerting gas. Use for manufacture of electronic / photovoltaic components. Extinguishing agent. Treatment of water intended for human consumption. Food applications. Medical applications. 	
Uses advised against	 Consumer use. Uses other than those listed above are not supported, contact your supplier for more information on other uses. Attention: These products must not be applied to humans or animals unless they are expressly designated as medical or medicinal gases! It is the responsibility of the end user to ensure that the product as supplied is suitable for its intended use. 	
1.3. Details of the supplier of the safety data s	heet	
Messer Tehnogas AD Beograd Banjicki put , 62 RS– 11090 Belgrade, Serbia T +381 11 35 37 200 - F +381 11 35 37 291 postoffice@messer.rs - www.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	Gases under pressure : Refrigerated liquefied gas	H281
2.2. Label elements		
Labelling according to R	legulation (EC) No. 1272/2008 [CLP]	
Hazard pictograms (CLP)		
	GHS04	
Signal word (CLP)	: Warning	



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Hazard statements (CLP) : H281 - Contains refrigerated gas; may cause cryogenic burns or injury. Precautionary statements (CLP) - Prevention : P282 - Wear cold insulating gloves and either face shield or eye protection. - Response P336+P315 - Thaw frosted parts with lukewarm water. Do not rub affected area. Get ÷ immediate medical advice/attention. - Storage : P403 - Store in a well-ventilated place. 2.3. Other hazards Asphyxiant in high concentrations. In high concentrations CO2 causes rapid circulatory insufficiency even at normal levels of oxygen concentration. Symptoms are headache, nausea and vomiting, which may lead to unconsciousness and death. Not classified as PBT or vPvB. The substance / mixture has no endocrine disrupting properties.

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 dioxide (refrigerated)	CAS no.: 124-38-9 EC no.: 204-696-9 Index no.: REACH no.: *1	≤ 100	Press. Gas (Ref. Liq.), H281

Contains no other components or impurities which will influence the classification of the product.

*1: Listed in Annex IV / V REACH, exempted from registration.

*3: Registration not required: Substance manufactured or imported < 1t/y.

3.2. Mixtures Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- Inhalation	 Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Maintain an open airway. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.
- Skin contact	 Carefully remove contaminated clothing. In case of frostbite spray with water for at least 15 minutes. Do not use hot water! Apply a sterile dressing. Obtain medical assistance.
- Eye contact	: Immediately flush eyes thoroughly with water for at least 15 minutes. Remove any contact lenses. Get medical advice / attention.
- Ingestion	: Ingestion is not considered a potential route of exposure.
4.2. Most important symptoms a	nd effects, both acute and delayed
	In high concentrations may cause asphyxiation.
	Symptoms may include loss of mobility/consciousness.
	Victim may not be aware of asphyxiation. See section 11.
	Low concentrations of CO_2 cause increased respiration and headache.
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.



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SECTION 5: Firefighting measures		
5.1. Extinguishing media		
- Suitable extinguishing media	: Water spray or fog. Product does not burn, use fire control measures appropriate for the surrounding fire.	
- Unsuitable extinguishing media	: Do not use water jet to extinguish.	
5.2. Special hazards arising from the substan	ice or mixture	
Specific hazards Hazardous combustion products	Exposure to fire may cause containers to rupture/explode.None.	
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. Move containers away from the fire area if this can be done without risk. 	
Special protective equipment for fire fighters	 In confined space use self-contained breathing apparatus. Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters. Standard EN 469 - Protective clothing for firefighters. Standard EN 659 - Protective gloves for firefighters. 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.
	Ensure adequate air ventilation.
	Use protective clothing.
	Stay upwind.
	Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
	See section 8 of the SDS for more information on personal protective equipment.
For emergency responders	: Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
	Oxygen detectors should be used when asphyxiating gases may be released.
	See section 5.3 of the SDS for more information.
6.2. Environmental precautions	
	Try to stop release.
	Liquid spillages can cause embrittlement of structural materials.
6.3. Methods and material for containment and cleaning up	
	Ventilate area.
6.4. Reference to other sections	
	See also sections 8 and 13.



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SECTION 7: Handling and storage

7.1. Precautions for safe handling	
Safe use of the product	 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. Wear personal protective equipment (See section 8). Only experienced and properly instructed persons should handle gases under pressure. 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. Containers, which contain or have contained flammable or explosive substances, must not be inerted with liquid carbon dioxide. Potential production of solid CO₂ particles must be ruled out. In order to rule out potential electrostatic discharge production, the system must be adequately grounded. Be aware of the risk of formation of static electricity with the use of CO₂ extinguishers. Do
Safe handling of the gas receptacle	 not use them in places where a flammable atmosphere may be present. 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 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 contant of the container.
7.2. Conditions for safe storage, including	
	For more guidance on the safe storage of refrigerated CO ₂ , refer to EIGA Doc. 66/22 "Refrigerated carbon dioxide storage at users' premises", downloadable at <u>http://www.eiga.eu</u> and consult your supplier.

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.

7.3. Specific end use(s)

None.



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SECTION 8: Exposure controls/personal protection

8.1. Control parameters

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EU - Indicative Occupational Exposure Limit (IOEL)		
Local name	Carbon dioxide	
IOEL TWA	9000 mg/m ³	
	5000 ppm	
Regulatory reference	COMMISSION DIRECTIVE 2006/15/EC	
Serbia - Occupational Exposure Limits		
Local name	угљен-диоксид	
OEL TWA	9000 mg/m³	
	5000 ppm	
Remark	ЕУ** – напомена да се ради о хемијским материјама за које су утврђене индикативне граничне вредности изложености према Директиви 2006/15/ЕЗ (друга 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)	
DNEL (Derived-No Effect Level) : None avail	lable.	
PNEC (Predicted No-Effect Concentration) : None avail	lable.	

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Provide adequate general and local exhaust ventilation.
Systems under pressure should be regularily checked for leakages.
Ensure exposure is below occupational exposure limits (where available).
Oxygen detectors should be used when asphyxiating gases may be released.
Consider the use of a work permit system e.g. for maintenance activities.
CO ₂ detectors should be used when CO ₂ may be released.

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

• Eye/face protection	 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. Wear goggles and a face shield when transfilling or breaking transfer connections. Standard EN 166 - Personal eye-protection - specifications.
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. Wear cold insulating gloves when transfilling or breaking transfer connections. Standard EN 511 - Cold insulating gloves, performance level 1 or higher. Recommended types include insulated gauntlets or gloves specifically selected to prevent liquid penetration and increase of an argonic liquide and to provide mechanical resistance.
- Other	 and ingress of cryogenic liquids and to provide mechanical resistance. Wear safety shoes while handling containers. Standard EN ISO 20345 - Personal protective equipment - Safety footwear.



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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. 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	: -78.5 °C Melting point at normal conditions does not exist. At atmospheric pressure sol
	carbon dioxide sublimes into gaseous carbon dioxide at -78.5°C
Boiling point	: -56.6 °C
Flammability	: Non flammable.
Lower explosion limit	: Not applicable.
Upper explosion limit	: Not applicable.
Flash point	: Not applicable for gases and gas mixtures.
Auto-ignition temperature	: Non flammable.
Decomposition temperature	: Not applicable.
рН	: Not applicable for gases and gas mixtures.
Viscosity, kinematic	: Not applicable for gases and gas mixtures.
Water solubility [20°C]	: 2000 mg/l
Partition coefficient n-octanol/water (Log Kow)	: 0.83
Vapour pressure [20°C]	: 57.3 bar(a)
Vapour pressure [50°C]	: No reliable data available.
Density and/or relative density	: Not applicable for gases and gas mixtures.
Relative vapour density (air=1)	: 1.52
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.
Critical temperature [°C]	: 31 °C
9.2.2. Other safety characteristics	
Molar mass	: 44 g/mol
Other data	: Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

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

10.2. Chemical stability

Stable under normal conditions.



SECTION 12: Ecological information

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10.3. Possibility of hazardous reactions	
	None.
10.4. Conditions to avoid	
	Avoid moisture in installation systems.
10.5. Incompatible materials	
	For additional information on compatibility refer to ISO 11114.
	Materials such as carbon steel, low alloy carbon steel and plastic become brittle at low temperatures and are subject to failure. Use appropriate materials compatible with the cryogenic conditions present in refrigerated liquefied gas systems.
10.6. Hazardous decomposition products	
	None.
SECTION 11: Toxicological information	
11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008	

Acute toxicity	: Toxicological effects not expected from this product if occupational exposure limit values are
	not exceeded.
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	: No known effects from this product.
STOT-single exposure	: No known effects from this product.
STOT-repeated exposure	: No known effects from this product.
Aspiration hazard	: Not applicable for gases and gas mixtures.
11.2. Information on other hazards	
Other information	 Unlike simple asphyxiants, carbon dioxide has the ability to cause death even when normal oxygen levels (20-21%) are maintained. 5% CO₂ has been found to act synergistically to increase the toxicity of certain other gases (CO, NO₂). CO₂ has been shown to enhance the production of carboxy- or met-hemoglobin by these gases possibly due to carbon dioxide's stimulatory effects on the respiratory and circulatory systems. For more information, see 'EIGA Safety Info 24: Carbon Dioxide, Physiological Hazards' at

www.eiga.eu

The substance / mixture has no endocrine disrupting properties.

<u>12.1. Toxicity</u>	
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	: No ecological damage caused by this product.
12.3. Bioaccumulative potential	
Assessment	: No ecological damage caused by this product.
<u>12.4. Mobility in soil</u>	
Assessment	: No ecological damage caused by this product.



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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	: Can cause frost damage to vegetation.
Effect on the ozone layer	: No effect on the ozone layer.
Global warming potential [CO2=1]	: 1
Effect on global warming	: When discharged in large quantities may contribute to the greenhouse effect. Contains fluorinated greenhouse gases listed in Annex I of EU 2024/573.

SECTION 13: Disposal considerations	
13.1. Waste treatment methods	
List of hazardous waste codes (from Commission Decision 2000/532/EC as amended)	 Discharge to atmosphere in large quantities should be avoided. Do not discharge into any place where its accumulation could be dangerous. May be vented to atmosphere in a well ventilated place. Return unused product in original container to supplier. 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. 16 05 05 : Gases in pressure containers other than those mentioned in 16 05 04*.
13.2. Additional information	
	External treatment and disposal of waste should comply with applicable local and/or

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.	: 2187
14.2. UN proper shipping name	
Transport by road/rail/inland waterways (ADR/RID/ADN)	: CARBON DIOXIDE, REFRIGERATED LIQUID
Transport by air (ICAO-TI / IATA-DGR)	: Carbon dioxide, refrigerated liquid
Transport by sea (IMDG)	: CARBON DIOXIDE, REFRIGERATED LIQUID
14.3. Transport hazard class(es)	
Labelling	
	2.2 : Non flammable, non-toxic gases.
Transport by road/rail/inland waterways (ADR/RID/ADN)	
Class	: 2
Classification code	: 3A
Hazard identification number	: 22
Tunnel Restriction	: C/E - Tank carriage : Passage forbidden through tunnels of category C, D and E. Other
	carriage : Passage forbidden through tunnels of category E
Transport by air (ICAO-TI / IATA-DGR)	
Class / Div. (Sub. risk(s))	: 2.2
Transport by sea (IMDG)	
Class / Div. (Sub. risk(s))	: 2.2
Emergency Schedule (EmS) - Fire	: F-C
Emergency Schedule (EmS) - Spillage	: S-V



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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	: P203.
(ADR/RID/ADN)	. F203.
Transport by air (ICAO-TI / IATA-DGR)	
Passenger and Cargo Aircraft	: 202.
Cargo Aircraft only	: 202.
Transport by sea (IMDG)	: P203.
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 ("SI. glasnik RS", br. 105/2013, 52/2017, 21/2019 i 29/2024)		None.
Pravilnik o izvozu i uvozu određenih opasnih hemikalija ("SI. glasnik RS" br. 93/23)	:	None.
Pravilnik o Listi opasnih materija i njihovim količinama i kriterijumima za određivanje vrste dokumenta koje izrađuje operater seveso postrojenja, odnosno kompleksa ("SI. glasnik RS", br. 41/2010, 51/2015 i 50/2018)	:	Not covered.
EU Regulations		
Restrictions on use Other information, restriction and prohibition regulations Seveso Directive : 2012/18/EU (Seveso III)	:	None. Not listed on the PIC list (Regulation EU 649/2012). Not listed on the POP list (Regulation EU 2019/1021). Not covered.
15.2. Chemical safety assessment		

A CSA does not need to be carried out for this product.



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SECTION 16: Other information

Indication of changes :	Revised safety data sheet in accordance with commission regulation (EU) No 2020/878. In Section 5, the Safety Data Sheet is supplemented with information about hazardous combustion products and special protective equipment for fire fighters. In Section 6, the Safety Data Sheet is supplemented with information about personal precautions, protective equipment and emergency procedures. In Section 8, the Safety Data Sheet is supplemented with information about exposure control and personal protection. In Section 10, the Safety Data Sheet is supplemented with information about possibility of hazardous reactions. In Section 12, the Safety Data Sheet is supplemented with information about 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 :	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 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 code - 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 PNEC - Predicted No Effect Concentration PPE - Personal Protection Equipment 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 - Repeated Exposure STOT - SE - Specific Target Organ Toxicity - Repeated Exposure STEL - Short Term Exposure Limit TWA -8-hour total weight average UEL - Upper explosive limit UFI - Unique Formula Identifier UN - United Nations VPWB - Very Persistent and Very Bioaccumulative
Training advice :	WGK - Water Hazard Class The hazard of asphyxiation is often overlooked and must be stressed during operator training. For more guidance, refer to EIGA SL 01 "Dangers of Asphyxiation", downloadable
Further information :	at <u>http://www.eiga.eu</u> 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



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Full text of H- and EUH-statements	
H281	Contains refrigerated gas; may cause cryogenic burns or injury.
Press. Gas (Ref. Liq.)	Gases under pressure : Refrigerated liquefied gas
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.

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