Safety Data Sheet

Carbon Dioxide, Refrigerated Liquid

SECTION 1: Identification of the hazardous chemical and of the supplier

1.1. Product identifier

Product form	Substance
Trade name	i) Carbon Dioxide, Refrigerated Liquid ii) PCC Carbon Dioxide, Refrigerated Liquid
CAS-No.	124-38-9
Formula	CO2

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

Recommended use	Industrial use
Restrictions on use	None.

1.3. Supplier's details

Linde Gas Products Malaysia Sdn Bhd (453560-K)
P.O. Box 10633, GPO Kuala Lumpur, 50670 WPKL.
No. 1, Jalan Graphite 3, Kawasan Perindustrian Bandar Mahkota Banting,
42700 Banting, Kuala Langat, Selangor Darul Ehsan.
T oll Free: 1800 883 888 / +603 5651 7000
csc.lg.my@linde.com

1.4. Emergency telephone number

Emergency phone number (24h): 1800 883 888
Poison center : Unit HAZMAT Malaysia, tel: 999

SECTION 2: Hazards identification

2.1. Classification of the hazardous chemical

Classification according to Industry Code of Practice on chemicals classification and hazard communication (2014)

Press. Gas (Ref. Liq.) H281

2.2. Label elements

Labelling according to Industry Code of Practice on chemicals classification and hazard communication (2014)

Hazard pictograms (GHS MY) :

GHS04

Signal word (GHS MY) : Warning

Hazard statements (GHS MY) : H281 - Contains refrigerated gas; may cause cryogenic burns or injury

Precautionary statements (GHS MY)

- Prevention : P282 - Wear cold insulating gloves/face shield/eye protection
- Response : P315 - Get immediate medical advice/attention.
  P336 - Thaw frosted parts with lukewarm water. Do no rub affected area
- Storage : P403 - Store in a well-ventilated place

2.3. Other hazards not contributing to the classification

Other hazards which do not result in classification	None,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.

SECTION 3: Composition and information of the ingredients of the hazardous chemical

3.1. Substances

Name	Product identifier	%
Carbon Dioxide, Refrigerated Liquid (Main constituent)	(CAS-No.) 124-38-9	100

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.

First-aid measures after skin contact : In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance. Wash skin with plenty of water.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Rinse eyes with water as a precaution.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure. Get immediate medical attention. Call a poison center or a doctor if you feel unwell.

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

Most important symptoms and 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. Low concentrations of CO2 cause increased respiration and headache. See section 11.

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

Other medical advice or treatment : None.

SECTION 5: Fire-fighting measures

5.1. Extinguishing media

Suitable extinguishing media : Water spray or fog. Water spray. Dry powder. Foam.

Unsuitable extinguishing media : Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

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

Reactivity in case of fire : No reactivity hazard other than the effects described in sub-sections below.

Hazardous combustion products : None.

5.3. Special protective equipment and precautions for fire-fighters

Protection during firefighting : Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

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. EN 15090 Footwear for firefighters. EN 443 Helmets for fire fighting in buildings and other structures. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

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. If leaking do not spray water onto container. Water surrounding area (from protected position) to contain fire. Move containers away from the fire area if this can be done without risk.

EAC code : 2T

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Try to stop release. Evacuate area. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Use protective clothing. Ensure adequate air ventilation. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Act in accordance with local emergency plan. Stay upwind. Oxygen detectors should be used when asphyxiating gases may be released.

6.1.1. For non-emergency personnel

Emergency procedures : Ventilate spillage area.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Try to stop release. Liquid spillages can cause embrittlement of structural materials.

6.3. Methods and material for containment and cleaning up

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

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Ensure good ventilation of the work station. Wear personal protective equipment.

Hygiene measures : Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

Safe handling of the gas receptacle : Refer to supplier's container handling instructions. Do not allow backfeed into the container. 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 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 remove or deface labels provided by the supplier for the identification of the content of the container. Suck back of water into the container must be prevented. Open valve slowly to avoid pressure shock.

Safe use of the product : 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. Do not breathe gas. Avoid release of product into work area. The product must be handled in accordance with good industrial hygiene and safety procedures. 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. Do not smoke while handling product. 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.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store in a well-ventilated place. Keep cool.

Conditions for safe storage, including any incompatibilities : 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.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

i) Carbon Dioxide, Refrigerated Liquid ii) PCC Carbon Dioxide, Refrigerated Liquid (124-38-9)		
Malaysia	Local name	Karbon dioksida # Carbon dioxide
Malaysia	PEL (OEL TWA) [1]	9000 mg/m³
Malaysia	PEL (OEL TWA) [2]	5000 ppm
Germany	AGW (OEL TWA) [1]	9100 mg/m³
Germany	AGW (OEL TWA) [2]	5000 ppm
Germany	Remark	DFG,EU
New Zealand	Local name	Carbon dioxide
New Zealand	WES-STEL (OEL STEL)	54000 mg/m³
New Zealand	WES-STEL (OEL STEL) [ppm]	30000 ppm
New Zealand	WES-TWA (OEL TWA) [1]	9000 mg/m³
New Zealand	WES-TWA (OEL TWA) [2]	5000 ppm
United Kingdom	WEL TWA (OEL TWA) [1]	9150 mg/m³
United Kingdom	WEL TWA (OEL TWA) [2]	5000 ppm
United Kingdom	WEL STEL (OEL STEL)	27400 mg/m³
United Kingdom	WEL STEL (OEL STEL) [ppm]	15000 ppm
USA - ACGIH	ACGIH OEL TWA [ppm]	5000 ppm
USA - ACGIH	ACGIH OEL STEL [ppm]	30000 ppm
USA - ACGIH	Remark (ACGIH)	Asphyxia
China	OEL PC-TWA	9000 mg/m³
China	OEL PC-STEL	18000 mg/m³

Exposure limit values for the other components

No additional information available

8.2. Monitoring

8.3. Appropriate engineering controls

Appropriate engineering controls : Ensure good ventilation of the work station. Provide adequate general and local exhaust ventilation. Systems under pressure should be regularly 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. CO2 detectors should be used when CO2 may be released.

8.4. Personal protective equipment

Wear safety shoes while handling containers.

Wear safety shoes while handling containers. Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

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. Wear leather safety gloves.

Eye protection:

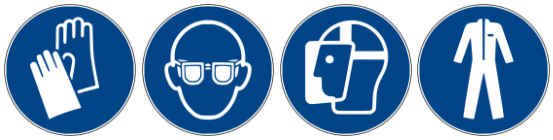
Safety glasses. Wear goggles and a face shield when transfilling or breaking transfer connections. Standard EN 166 - Personal eye-protection - specifications

Skin and body protection:

Wear suitable protective clothing

Respiratory protection:

Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmospheres. Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known. Use gas filters with full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers. Gas filters do not protect against oxygen deficiency. Standard EN 14387 - Gas filter(s), combined filter(s) and standard EN136, full face masks . Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.



Thermal hazard protection	:	None in addition to the above sections.
Environmental exposure controls	:	None necessary. Avoid release to the environment.

SECTION 9: Physical and chemical properties

Physical state	:	Gas
Appearance	:	No data available
Colour	:	Colourless. White.
Odour	:	No odour warning properties.
Odour threshold	:	Odour threshold is subjective and inadequate to warn of overexposure.
pH	:	Not applicable for gases and gas mixtures.
Melting point, Freezing point	:	Melting point: 78.5 °C At atmospheric pressure dry ice sublimes into gaseous carbon dioxide.
Boiling point	:	-56.6 °C
Flash point	:	Not applicable for gases and gas mixtures.
Critical temperature	:	30 °C
Auto-ignition temperature	:	Non flammable.
Decomposition temperature	:	Not applicable.
Flammability	:	Non flammable.
Vapour pressure	:	Vapour pressure: 57.3 bar(a) Vapour pressure at 50°C: Not applicable.
Evaporation rate	:	Relative evaporation rate (ether=1): Not applicable for gases and gas mixtures.
Explosive limits	:	Non flammable.
Lower explosion limit	:	No data available
Upper explosion limit	:	No data available
Explosive properties	:	Not applicable.
Minimum ignition energy	:	No data available
Solubility	:	Water: 2000 mg/l Completely soluble.
Density	:	Relative density: 0.82
Relative density	:	Relative vapour density at 20°C: Not applicable. Relative gas density: 1.52
Viscosity	:	Viscosity, dynamic: No reliable data available. Viscosity, kinematic: 1.52No reliable data available.
Critical pressure	:	7375 kPa
Gas group	:	Press. Gas (Ref. Liq.)
Partition coefficient n-octanol/water (Log Pow)	:	0.83

Molecular mass	:	44 g/mol
Oxidising properties	:	Not applicable.
Physical state	:	Refrigerated solidified gas
Additional information	:	Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

Chemical stability	:	Stable under normal conditions.
Conditions to avoid	:	Avoid moisture in installation systems.
Hazardous decomposition products	:	None.
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.
Possibility of hazardous reactions	:	None.
Reactivity	:	No reactivity hazard other than the effects described in sub-sections below.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral)	:	Not classified
Acute toxicity (dermal)	:	Not classified
Acute toxicity (inhalation)	:	Not classified
Skin corrosion or irritation	:	Not classified pH: Not applicable for gases and gas mixtures.
Serious eye damage or eye irritation	:	Not classified
Respiratory or skin sensitisation	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (STOT) – single exposure	:	Not classified
Specific target organ toxicity (STOT) – repeated exposure	:	Not classified
Aspiration hazard	:	Not classified

i) Carbon Dioxide, Refrigerated Liquid ii) PCC Carbon Dioxide, Refrigerated Liquid (124-38-9)	
Viscosity, kinematic (calculated value) (40 °C)	No reliable data available.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	:	No data available.
Hazardous to the aquatic environment, short-term (acute)	:	Not classified
Hazardous to the aquatic environment, long-term (chronic)	:	Not classified

i) Carbon Dioxide, Refrigerated Liquid ii) PCC Carbon Dioxide, Refrigerated Liquid (124-38-9)	
Partition coefficient n-octanol/water (Log Kow)	Not applicable for gas mixtures.
Partition coefficient n-octanol/water (Log Pow)	0.83

12.2. Persistence and degradability

i) Carbon Dioxide, Refrigerated Liquid ii) PCC Carbon Dioxide, Refrigerated Liquid (124-38-9)	
Persistence and degradability	No data available.

12.3. Bioaccumulative potential

i) Carbon Dioxide, Refrigerated Liquid ii) PCC Carbon Dioxide, Refrigerated Liquid (124-38-9)	
Partition coefficient n-octanol/water (Log Pow)	See section 12.1 on ecotoxicology
Partition coefficient n-octanol/water (Log Kow)	See section 12.1 on ecotoxicology
Bioaccumulative potential	No ecological damage caused by this product.

12.4. Mobility in soil

i) Carbon Dioxide, Refrigerated Liquid ii) PCC Carbon Dioxide, Refrigerated Liquid (124-38-9)	
Mobility in soil	No additional information available
Partition coefficient n-octanol/water (Log Pow)	See section 12.1 on ecotoxicology
Partition coefficient n-octanol/water (Log Kow)	See section 12.1 on ecotoxicology
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution. Partition into soil is unlikely.

12.5. Other adverse effects

Ozone : Not classified

Effect on global warming : Contains greenhouse gas(es),When discharged in large quantities may contribute to the greenhouse effect.

GWP 100 years : 1

Effect on the ozone layer : None.

Other adverse effects : Can cause frost damage to vegetation.

SECTION 13: Disposal information

13.1. Disposal methods

Waste treatment methods : Dispose of contents/container in accordance with licensed collector's sorting instructions. Do not discharge into any place where its accumulation could be dangerous. May be vented to atmosphere in a well ventilated place. Discharge to atmosphere in large quantities should be avoided. Return unused product in original container to supplier.

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

{ 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.

SECTION 14: Transportation information

14.1. UN number

UN-No.(UN RTDG) : 2187

UN-No. (IMDG) : 2187

UN-No. (IATA) : 2187

14.2. Proper Shipping Name

Proper Shipping Name (UN RTDG) : CARBON DIOXIDE, REFRIGERATED LIQUID

Proper Shipping Name (IMDG) : CARBON DIOXIDE, REFRIGERATED LIQUID

Proper Shipping Name (IATA) : Carbon dioxide, refrigerated liquid

14.3. Transport hazard class(es)

UN RTDG

Transport hazard class(es) (UN RTDG) : 2.2
Danger labels (UN RTDG) : 2.2

:

IMDG
Transport hazard class(es) (IMDG) : 2.2
Danger labels (IMDG) : 2.2

:

IATA
Transport hazard class(es) (IATA) : 2.2
Danger labels (IATA) : 2.2

:

14.4. Packing group

Packing group (UN RTDG) : Not applicable
Packing group (IMDG) : Not applicable
Packing group (IATA) : Not applicable

14.5. Environmental hazards

Dangerous for the environment : No
Marine pollutant : No
Other information : No supplementary information available

14.6. Special precautions for user

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.

- UN RTDG
Limited quantities (UN RTDG) : 120 ml

Excepted quantities (UN RTDG) : E1
Packing instruction (UN RTDG) : P203

Portable tank and bulk container special instructions (UN RTDG)	:	T75
Portable tank and bulk container special provisions (UN RTDG)	:	TP5
- IMDG		
Limited quantities (IMDG)	:	120 ml
Excepted quantities (IMDG)	:	E1
Packing instructions (IMDG)	:	P203
Tank instructions (IMDG)	:	T75
Tank special provisions (IMDG)	:	TP5
EmS-No. (Fire)	:	F-C - FIRE SCHEDULE Charlie - NON-FLAMMABLE GASES
EmS-No. (Spillage)	:	S-V - SPILLAGE SCHEDULE Victor - GASES (NON-FLAMMABLE, NON-TOXIC)
Stowage category (IMDG)	:	D
Properties and observations (IMDG)	:	Non-flammable, liquefied gas, colourless and odourless. Heavier than air (1.5). Cannot remain in the liquid state above 31°C.
MFAG-No	:	120
- IATA		
PCA Excepted quantities (IATA)	:	E1
PCA Limited quantities (IATA)	:	Forbidden
PCA limited quantity max net quantity (IATA)	:	Forbidden
PCA packing instructions (IATA)	:	202
PCA max net quantity (IATA)	:	50kg
CAO packing instructions (IATA)	:	202
CAO max net quantity (IATA)	:	500kg
ERG code (IATA)	:	2L

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

14.8. 14.8. Hazchem or Emergency Action Code

EAC code : 2T.

SECTION 15: Regulatory information

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

Occupational Safety and Health Act 1994 and relevant regulations:

Occupational Safety and Health (Classification, Labeling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013.
Occupational Safety and Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000.

Environment Quality Act 1974 & regulations:

Environment Quality (Clean Air) Regulations 2014.
Environmental Quality (Scheduled Wastes) Regulations 2005.

15.2. 15.2. Chemical safety assessment

SECTION 16: Other information

Version	:	5.0
Issue date	:	16/01/2013

Revision date	:	10/10/2024
Supersedes	:	27/11/2023
Abbreviations and acronyms	:	ATE - Acute Toxicity Estimate CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008 REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006 EINECS - European Inventory of Existing Commercial Chemical Substances CAS# - Chemical Abstract Service number PPE - Personal Protection Equipment LC50 - Lethal Concentration to 50 % of a test population RMM - Risk Management Measures PBT - Persistent, Bioaccumulative and Toxic vPvB - Very Persistent and Very Bioaccumulative STOT- SE : Specific Target Organ Toxicity - Single Exposure CSA - Chemical Safety Assessment EN - European Standard UN - United Nations ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road IATA - International Air Transport Association IMDG code - International Maritime Dangerous Goods RID - Regulations concerning the International Carriage of Dangerous Goods by Rail WGK - Water Hazard Class STOT - RE : Specific Target Organ Toxicity - Repeated Exposure
Training advice	:	The hazard of asphyxiation is often overlooked and must be stressed during operator training.

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.