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
Chemical description	:	Carbon dioxide (refrigerated) CAS No : 124-38-9 EC No : 204-696-9 EC Index No : ---
Registration-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. Perform risk assessment prior to use Test gas/Calibration gas Purge gas, diluting gas, inerting gas Purging Laboratory use Use for manufacture of electronic/photovoltaic components Shield gas for welding processes Contact supplier for more information on uses

1.3. Details of the supplier of the safety data sheet

Company identification	:	Messer Tehnogas AD Banjicki put 62 11090 Beograd Serbia +38 111 353 7210

1.4. Emergency telephone number

Emergency telephone number	:	+381(0) 11 360 8440 (24h) Emergency telephone number

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Physical hazards Press. Gas (Ref. Liq.) H281

Full text of H-statements see section 16.

2.2. Label elements

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

Hazard pictograms (CLP) :

GHS04

Signal word (CLP) : Warning

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

Precautionary statements (CLP)

- Prevention : P282 - Wear cold insulating gloves, face shield, 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

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Carbon dioxide (refrigerated)	(CAS No) 124-38-9 (EC No) 204-696-9 (EC Index No) --- (Registration-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.*

**2: Registration deadline not expired.*

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

Full text of H-statements see section 16.

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. Call a doctor. Apply artificial respiration if breathing stopped
- Skin contact : In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance
- Eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes
- Ingestion : Ingestion is not considered a potential route of exposure

4.2. 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

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

: None

SECTION 5: Fire-fighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Water spray or fog
- 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

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
Exposure to fire may cause containers to rupture/explode
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

Special protective equipment for fire fighters : Use self-contained breathing apparatus
Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask
Standard EN 469 - Protective clothing for firefighters. Standard - EN 659: Protective gloves for firefighters

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

: 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

6.2. Environmental precautions

: Try to stop release

6.3. Methods and material for containment and cleaning up

: Ventilate area
Liquid spillages can cause embrittlement of structural materials

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 : 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
Do not remove or deface labels provided by the supplier for the identification of the cylinder contents
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 atmosphere.

Safe handling of the gas receptacle : Refer to supplier's container handling instructions
Do not allow backfeed into the container
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.

7.2. 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.

7.3. Specific end use(s)

: None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Carbon dioxide (refrigerated) (124-38-9)		
OEL : Occupational Exposure Limits		
Austria	TWA (AT) OEL 8h [mg/m³]	9000 mg/m³
	STEL (AT) OEL 15min [ppm]	10000 ppm (60' Mow / 3x)
	STEL (AT) OEL 15min [mg/m³]	18000 mg/m³ (60' Mow / 3x)
	TWA (AT) OEL 8h [ppm]	5000 ppm
Belgium	TWA (BE) OEL 8h [mg/m3]	9131 mg/m³
	TWA (BE) OEL 8h [ppm]	5000 ppm
	STEL (BE) OEL 15min [mg/m3]	54784 mg/m³
	STEL (BE) OEL 15min [ppm]	30000 ppm
Bulgaria	TWA (BG) OEL 8h [mg/m³]	9000 mg/m³
Cyprus	TWA (CY) OEL 8h [mg/m³]	9000 mg/m³
	TWA (CY) OEL 8h [ppm]	5000 ppm
Estonia	TWA (EE) OEL 8h [mg/m³]	9000 mg/m³
	TWA (EE) OEL 8h [ppm]	5000 ppm
France	TWA (FR) OEL 8h [mg/m³]	9000 mg/m³
	TWA (FR) OEL 8h [ppm]	5000 ppm
Germany	TWA (DE) OEL 8h [mg/m3] TRGS 900	9100 mg/m³
	TWA (DE) OEL 8h [ppm] TRGS 900	5000 ppm
	Peak exposure limitation factor (DE) OEL TRGS 900	2
Greece	TWA (GR) OEL 8h [mg/m³]	9000 mg/m³

	TWA (GR) OEL 8h [ppm]	5000 ppm
	STEL (GR) OEL 15min [mg/m³]	54000 mg/m³
	STEL (GR) OEL 15min [ppm]	30000 ppm
Italy	TWA (IT) OEL 8h [mg/m³]	9000 mg/m³
	TWA (IT) OEL 8h [ppm]	5000 ppm
Latvia	TWA (LV) OEL 8h [mg/m³]	9000 mg/m³
	TWA (LV) OEL 8h [ppm]	5000 ppm
Spain	TWA (ES) OEL 8h [mg/m3]	9150 mg/m³
	TWA (ES) OEL 8h [ppm]	5000 ppm
Switzerland	TWA (CH) OEL 8h [mg/m³]	9000 mg/m³
	TWA (CH) OEL 8h [ppm]	5000 ppm
Netherlands	MAC TWA 8H (NL) [mg/m³]	9000 mg/m³
United Kingdom	WEL - LTEL - UK [mg/m³]	9150 mg/m³
	WEL - LTEL - UK [ppm]	5000 ppm
	WEL - STEL - UK [mg/m³]	27400 mg/m³
	WEL - STEL - UK [ppm]	15000 ppm
Czech Republic	TWA (CZ) OEL 8h [mg/m³]	9000 mg/m³
	TWA (CZ) OEL 8h [ppm]	5000 ppm
	STEL (CZ) OEL 15min [mg/m³]	45000 mg/m³
	STEL (CZ) OEL 15min [ppm]	25000 ppm
Denmark	TWA (DK) OEL 8h [mg/m³]	9000 mg/m³
	TWA (DK) OEL 8h [ppm]	5000 ppm
Finland	TWA (FI) OEL 8h [mg/m³]	9100 mg/m³
	TWA (FI) OEL 8h [ppm]	5000 ppm
Hungary	TWA (HU) OEL 8h [mg/m3]	9000 mg/m³
Ireland	OEL (IE)-(8-hour reference period) [mg/m3]	9000 mg/m³
	OEL (IE)-(8-hour reference period) [ppm]	5000 ppm
	OEL (IE)-(15min reference period) [mg/m3]	27000 mg/m³
	OEL (IE)-(15min reference period) [ppm]	15000 ppm
Lithuania	TWA (LT) OEL 8h [mg/m3]	9000 mg/m³
	TWA (LT) OEL 8h [ppm]	5000 ppm
Malta	TWA (MT) OEL 8h [mg/m³]	9000 mg/m³
	TWA (MT) OEL 8h [ppm]	5000 ppm
Norway	TWA (NO) OEL 8h [mg/m³]	9000 mg/m³
	TWA (NO) OEL 8h [ppm]	5000 ppm
Poland	TWA (PL) OEL 8h [mg/m³]	9000 mg/m³
	STEL (PL) OEL 15min [mg/m³]	27000 mg/m³
Romania	TWA (RO) OEL 8h [mg/m³]	9000 mg/m³
	TWA (RO) OEL 8h [ppm]	5000 ppm
Slovakia	Maximum permissible exposure limit, average, 8h (SK) [mg/m³]	9000 mg/m³
	Maximum permissible exposure limit, average, 8h (SK) [ppm]	5000 ppm
Sweden	TWA (SV) OEL 8h [mg/m³]	9000 mg/m³
	TWA (SV) OEL 8h [ppm]	5000 ppm
	STEL (SV) OEL 15min [mg/m³]	18000 mg/m³
	STEL (SV) OEL 15min [ppm]	10000 ppm
Portugal	TWA (PT) OEL 8h [ppm]	5000 ppm
	STEL (PT) OEL 15min [ppm]	30000 ppm

DNEL (Derived-No Effect Level) : No data available.

PNEC (Predicted No-Effect Concentration) : No data available.

8.2. Exposure controls

8.2.1. Appropriate engineering controls

: 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

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:
Protect eyes, face and skin from liquid splashes
PPE compliant to the recommended EN/ISO standards should be selected

• Eye/face protection : Wear safety glasses with side shields
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 risk

- Other : 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
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask

• Thermal hazards : Wear cold insulating gloves when transfilling or breaking transfer connections
Standard EN 511 - Cold insulating gloves

8.2.3. Environmental exposure controls

: None necessary.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance

- Physical state at 20°C / 101.3kPa : Liquid.
- Colour : Colourless.

Odour	:	No odour warning properties.
Odour threshold	:	Odour threshold is subjective and inadequate to warn of overexposure.
pH value	:	Not applicable.
Molar mass	:	44 g/mol
Melting point	:	78.5 °C
Boiling point	:	-56.6 °C (s)
Flash point	:	Not applicable for gases and gas mixtures.
Critical temperature [°C]	:	30 °C
Evaporation rate (ether=1)	:	Not applicable for gases and gas mixtures.
Flammability range	:	Non flammable.
Vapour pressure [20°C]	:	57.3 bar(a)
Vapour pressure [50°C]	:	Not applicable.
Relative density, gas (air=1)	:	1.52
Relative density, liquid (water=1)	:	0.82

Solubility in water	:	2000 mg/l Completely soluble.
Partition coefficient n-octanol/water [log Kow]	:	0.83
Auto-ignition temperature	:	Not applicable.
Viscosity [20°C]	:	Not applicable.
Explosive Properties	:	Not applicable
Oxidising Properties	:	None

9.2. Other information

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

10.3. Possibility of hazardous reactions

: None

10.4. Conditions to avoid

: None under recommended storage and handling conditions (see section 7)

10.5. Incompatible materials

: None
For additional information on compatibility refer to ISO 11114

10.6. Hazardous decomposition products

: None

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	:	In high concentrations CO2 cause rapid circulatory insufficiency. Symptoms are headache, nausea and vomiting, which may lead to unconsciousness 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
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

SECTION 12: Ecological information

12.1. Toxicity

Assessment : No ecological damage caused by this product.

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.

12.4. Mobility in soil

Assessment : No ecological damage caused by this product.

12.5. Results of PBT and vPvB assessment

Assessment : Not classified as PBT or vPvB

12.6. Other adverse effects

: Can cause frost damage to vegetation.

Effect on the ozone layer : None

Global warming potential [CO2=1] : 1

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

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Consult supplier for specific recommendations
May be vented to atmosphere in a well ventilated place
Discharge to atmosphere in large quantities should be avoided
Do not discharge into any place where its accumulation could be dangerous
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

List of hazardous waste codes (from Commission Decision 2001/118/EC) : 16 05 05 : Gases in pressure containers other than those mentioned in 16 05 04

13.2. Additional information

: None

SECTION 14: Transport information

14.1. UN number

UN-No. : 2187

14.2. UN proper shipping name

Transport by road/rail (ADR/RID) : 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 (ADR/RID)

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

14.4. Packing group

Transport by road/rail (ADR/RID) : 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 (ADR/RID) : 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 (ADR/RID) : P203

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 cylinder 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. Transport in bulk according to Annex II of Marpol and the IBC Code

: Not applicable.

SECTION 15: Regulatory information

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

EU-Regulations

Restrictions on use : None

Seveso Directive : 2012/18/EU (Seveso III) : Not covered

National regulations

National legislation : Ensure all national/local regulations are observed.

Water hazard class (WGK) : nwg - Non-hazardous to water

Kenn-Nr. : 256

15.2. Chemical safety assessment

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

SECTION 16: Other information

Indication of changes : Revised safety data sheet in accordance with commission regulation (EU) No 2015/830.

Training advice : The hazard of asphyxiation is often overlooked and must be stressed during operator training.

Further information : This Safety Data Sheet has been established in accordance with the applicable European Union legislation.

Full text of H- and EUH-statements

Press. Gas (Ref. Liq.)	Gases under pressure : Refrigerated liquefied gas
H281	Contains refrigerated gas; may cause cryogenic burns or injury

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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