Safety Data Sheet

Nitrous oxide (refrigerated)

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878
Reference number: RS-O2-093B
Issue date: 02/01/2019 Revision date: 09/01/2024 Supersedes: 09/01/2023 Version: 3C

Danger

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

1.1. Product identifier

Trade name	:	Nitrous oxide (refrigerated); Gourmet L– E942
SDS no	:	RS-O2-093B
Other means of identification	:	Nitrous oxide
CAS no.	:	10024-97-2
EC no.	:	233-032-0
Index no.	:	---
REACH no.	:	01-2119970538-25
Chemical formula	:	N_2O

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. Perform risk assessment prior to use. Industrial and professional uses. Food applications. Medicinal application.
Uses advised against	:	Do not inhale product on purpose because of the risk of asphyxiation or narcotic effects. 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!

1.3. Details of the supplier of the safety data sheet

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	Oxidising Gases, Category 1	H270
	Gases under pressure : Refrigerated liquefied gas	H281
Health hazards	Specific target organ toxicity – Single exposure, Category 3, Narcosis	H336

2.2. Label elements

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

Hazard pictograms (CLP) :

GHS03 GHS04 GHS07

Signal word (CLP) : Danger

Hazard statements (CLP) : H270 - May cause or intensify fire; oxidiser.
H281 - Contains refrigerated gas; may cause cryogenic burns or injury.
H336 - May cause drowsiness or dizziness.

Precautionary statements (CLP)

- Prevention : P220 - Keep away from clothing and other combustible materials.
P244 - Keep valves and fittings free from oil and grease.
P261 – Avoid breathing gas.
P271 – Use only outdoors or in a well-ventilated area.
P282 - Wear cold insulating gloves and either face shield or eye protection.

- Response : P304 + P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P312 – Call a POISON CENTER or doctor.
P336+P315 - Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
P370+P376 - In case of fire: Stop leak if safe to do so.

- Storage : P403+P410+P233 - Store in a well-ventilated place. Protect from sunlight. 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 : Do not inhale product on purpose because of the risk of asphyxiation or narcotic effects.
Contains greenhouse gases listed in Annex I of EU 2024/573.

2.3. Other hazards

Contact with liquid may cause cold burns / frostbite.
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
Nitrous oxide (refrigerated)	CAS no.: 10024-97-2 EC no.: 233-032-0 Index no.: --- REACH no.: 01-2119970538-25	≤ 100	Ox. Gas 1, H270 Press. Gas (Ref. Liq.), H281 STOT SE 3, H336

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 : 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 : Get immediate medical attention.

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

In low concentrations may cause narcotic effects. Symptoms may include dizziness, headache, nausea and loss of co-ordination. 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.
  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 substance or mixture

Specific hazards : Supports combustion.
Exposure to fire may cause containers to rupture/explode.

Hazardous combustion products : Nitric oxide/nitrogen dioxide.

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.
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 : 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.
Use protective clothing.
Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
Stay upwind.
See section 8 of the SDS for more information on personal protective equipment.

For emergency responders : Monitor concentration of released product.
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.
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.

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. Keep equipment free from oil and grease!
Only experienced and properly instructed persons should handle gases under pressure.
Wear personal protective equipment (See section 8).
Consider pressure relief device(s) in gas installations.
Ensure the complete gas system was (or is regularily) checked for leaks before use.
Clean all surfaces in direct contact with nitrous oxide as for oxygen service.
Use no oil or grease. Use only lubricants and sealings approved for the specific gas service.
Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Temperatures above 150°C (300°F) shall be avoided by all practical means, to reduce the likelihood of an explosive decomposition of the nitrous oxide.
Temperatures above 150°C (300°F) shall be avoided by all practical means, to reduce the likelihood of an explosive decomposition of the nitrous oxide.
Use self-limiting heating devices. Direct contact electric immersion heaters are not allowed.
Nitrous oxide transfer pumps shall be provided with an interlock to prevent dry running.
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.
For more guidance on safe use, refer to the EIGA Doc.176 “Safe practices for storage and handling of Nitrous oxide", downloadable at http://www.eiga.eu. and consult your supplier.

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 flammable gases and other flammable materials in store.
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

Nitrous oxide (refrigerated) (10024-97-2)	
DNEL: Derived no effect level (Workers)	
Long-term - systemic effects, inhalation	183 mg/m³

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

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Provide adequate general and local exhaust ventilation.
Product to be handled in a closed system.
Systems under pressure should be regularly checked for leakages.
Ensure exposure is below occupational exposure limits (where available).
Gas detectors should be used when oxidising 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 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 ingress of cryogenic liquids and to provide mechanical resistance.

- Other : Consider the use of flame resistant safety clothing.
Standard EN ISO 14116 - Limited flame spread materials.
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 liquid.
Odour	:	Sweetish. Poor warning properties at high concentrations.
Melting point / Freezing point	:	-90.81 °C
Boiling point	:	-88.5 °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.
pH	:	Not applicable for gases and gas mixtures.
Viscosity, kinematic	:	No reliable data available.
Water solubility [20°C]	:	1500 mg/l
Partition coefficient n-octanol/water (Log Kow)	:	0.4
Vapour pressure [20°C]	:	50.8 bar(a)
Vapour pressure [50°C]	:	Not applicable.
Density and/or relative density	:	Not applicable for gases and gas mixtures.
Relative vapour density (air=1)	:	1.5
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	:	Oxidiser.
- Coefficient of oxygen equivalency (Ci)	:	0.6
Critical temperature [°C]	:	36.4 °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

At temperatures over 575°C and at atmospheric pressure, nitrous oxide decomposes into nitrogen and oxygen. In the presence of catalysts (e.g. halogen products, mercury, nickel, platinum) the rate of decomposition increases and decomposition can occur at even lower temperatures. Nitrous oxide dissociation is irreversible and exothermic, leading to a considerable rise in pressure.
Stable under normal conditions.

10.3. Possibility of hazardous reactions

May react violently with reducing agents. Violently oxidises organic material.

10.4. Conditions to avoid

Avoid moisture in installation systems.

10.5. Incompatible materials

May react violently with combustible materials.
May react violently with reducing agents.
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

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 : No additional information available

Nitrous oxide (refrigerated) (10024-97-2)	
LC50 Inhalation - Rat [ppm]	500000 ppm/4h

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 : May cause drowsiness or dizziness.
STOT-repeated exposure : Hemotoxic effect.
Neurologic effect.
Target organ(s) : At low concentrations: Central nervous system. Erythrocytes. Kidneys. Liver.
Aspiration hazard : Not applicable for gases and gas mixtures.

11.2. Information on other hazards

Other information : Inhalation causes narcotic effects.
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 : Not applicable for inorganic products. Study scientifically unjustified.

12.3. Bioaccumulative potential

Assessment : 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 : Can cause frost damage to vegetation.

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

Global warming potential [CO_2=1] : 273

Effect on global warming : When discharged in large quantities may contribute to the greenhouse effect.
Contains greenhouse gases listed in Annex I of EU 2024/573.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Discharge to atmosphere in large quantities should be avoided.
Contact supplier if guidance is required. 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. 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.

List of hazardous waste codes (from Commission Decision 2000/532/EC as amended) : 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. : 2201

14.2. UN proper shipping name

Transport by road/rail/inland waterways (ADR/RID/ADN) : NITROUS OXIDE, REFRIGERATED LIQUID

Transport by air (ICAO-TI / IATA-DGR) : Nitrous oxide, refrigerated liquid

Transport by sea (IMDG) : NITROUS OXIDE, REFRIGERATED LIQUID

14.3. Transport hazard class(es)

Labelling :

2.2 : Non flammable, non-toxic gases.
5.1 : Oxidizing substances.

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

Class	:	2
Classification code	:	3O
Hazard identification number	:	225
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 sea (IMDG)

Class / Div. (Sub. risk(s))	:	2.2 (5.1)
Emergency Schedule (EmS) - Fire	:	F-C
Emergency Schedule (EmS) - Spillage	:	S-W

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)	:	P203.
Transport by air (ICAO-TI / IATA-DGR)		
Passenger and Cargo Aircraft	:	Forbidden.
Cargo Aircraft only	:	Forbidden.
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 ("Sl. glasnik RS", br. 105/2013, 52/2017, 21/2019 i 29/2024)	:	None.
Pravilnik o izvozu i uvozu određenih opasnih hemikalija („Sl. 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 ("Sl. glasnik RS", br. 41/2010, 51/2015 i 50/2018)	:	Listed.

EU Regulations

Restrictions on use	:	None.
Other information, restriction and prohibition regulations	:	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)	:	Listed.

15.2. Chemical safety assessment

A CSA has been carried out.

SECTION 16: Other information

Indication of changes	:	Revised Safety Data Sheet in accordance with commission regulation (EU) No 2020/878. In Section 2, the Safety Data Sheet is supplemented with information about label elements and other hazards. In Section 4, the Safety Data Sheet is supplemented with information about first aid measures. In Section 7, the Safety Data Sheet is supplemented with information about safe use of the product. In Section 8, the Safety Data Sheet is supplemented with information about exposure control and personal protection. 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 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 - 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 WGK - Water Hazard Class

Training advice	:	Receptacle under pressure. 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 at http://www.eiga.eu
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	
H270	May cause or intensify fire; oxidiser.
H281	Contains refrigerated gas; may cause cryogenic burns or injury.
H336	May cause drowsiness or dizziness.
Ox. Gas 1	Oxidising Gases, Category 1
Press. Gas (Ref. Liq.)	Gases under pressure : Refrigerated liquefied gas
STOT SE 3	Specific target organ toxicity – Single exposure, Category 3, Narcosis

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.

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Identified Uses	Es N°	Short title	Page
Feedstock in chemical processes	EIGA093 B-1	Industrial uses, closed contained conditions	**13**
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Transfilling in pressure receptacles	EIGA093 B-1	Industrial uses, closed contained conditions	**13**
Calibration of analysis equipment	EIGA093 B-1	Industrial uses, closed contained conditions	**13**
Refilling of refrigeration equipment	EIGA093 B-1	Industrial uses, closed contained conditions	**13**
Electronic component manufacture	EIGA093 B-1	Industrial uses, closed contained conditions	**13**
Pressure gas in airbag inflators	EIGA093 B-1	Industrial uses, closed contained conditions	**13**
Aerosol propellant	EIGA093 B-2	Professional uses in open conditions.	**19**

1. EIGA093B-1: Industrial uses, closed contained conditions

1.1. Title section

Industrial uses, closed contained conditions	
ES Ref.: EIGA093B-1 Revision date: 1/31/2017	

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

Environment	Use descriptors
CS1	ERC4, ERC6b, ERC7

Worker	Use descriptors
CS2	PROC1
CS3	PROC2
CS4	PROC3
CS5	PROC9

Assessment method	MEASE EUSES v2.1

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: ERC4, ERC6b, ERC7

ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC6b	Use of reactive processing aid at industrial site (no inclusion into or onto article)
ERC7	Use of functional fluid at industrial site

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)	
Annual site tonnage:	250
Emission Days (days/year)	365

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

Conditions and measures related to sewage treatment plant
Wastewater emission controls are not applicable as there is no direct release to wastewater

Conditions and measures related to treatment of waste (including article waste)
See section 13 of the SDS. No additional information

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.	
Duration of task	≤ 8 h/day
Exposure duration	Occasional exposure, e.g. during maintenance and sampling, connecting/ disconnecting containers .
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
Personal protection measures have to be applied in case of potential exposure only.
See section 8 of the SDS.

Other conditions affecting workers exposure
Indoor 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.	
Duration of task	≤ 8 h/day
Exposure duration	Occasional exposure, e.g. during maintenance and sampling, connecting/ disconnecting containers .
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
Personal protection measures have to be applied in case of potential exposure only.
See section 8 of the SDS.

Other conditions affecting workers exposure
Indoor use

1.2.4. Control of worker exposure: PROC3

PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

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.	
Duration of task	≤ 8 h/day
Exposure duration	Occasional exposure, e.g. during maintenance and sampling, connecting/ disconnecting containers .
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
Personal protection measures have to be applied in case of potential exposure only.
See section 8 of the SDS.

Other conditions affecting workers exposure
Indoor use

1.2.5. 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.	
Duration of task	≤ 8 h/day
Exposure duration	Occasional exposure, e.g. during maintenance and sampling, connecting/ disconnecting containers .
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
Personal protection measures have to be applied in case of potential exposure only.
See section 8 of the SDS.

Other conditions affecting workers exposure
Indoor use

1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure: ERC4, ERC6b, ERC7

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	0.018 mg/m³	Indoor use, General ventilation, Without LEV, MEASE	0

1.3.3. Worker exposure: PROC2

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Inhalation - Long-term - systemic effects	14.937 mg/m³	Indoor use, General ventilation, Without LEV, MEASE	0.082

1.3.4. Worker exposure: PROC3

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Inhalation - Long-term - systemic effects	37.342 mg/m³	Indoor use, General ventilation, Without LEV, MEASE	0.204

1.3.5. Worker exposure: PROC9

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Inhalation - Long-term - systemic effects	74.683 mg/m³	Indoor use, General ventilation, Without LEV, MEASE	0.408

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 : MEASE model available at: http://www.ebrc.de/industrial-chemicals-reach/projects-and-references/mease.php

2. EIGA093B-2: Professional uses in open conditions.

2.1. Title section

Professional uses in open conditions.	
ES Ref.: EIGA093B-2 Revision date: 1/31/2017	

Processes, tasks, activities covered	Professional uses of a processing aid in non-industrial settings.

Environment	**Use descriptors**
CS1	ERC8a

Worker	**Use descriptors**
CS2	PROC11

Assessment method	ConsExpo EUSES v2.1

2.2. Conditions of use affecting exposure

2.2.1. Control of environmental exposure: ERC8a

ERC8a	Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor)

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)
No additional information

Technical and organisational conditions and measures
Ensure operatives are trained to minimise exposure

Conditions and measures related to sewage treatment plant
No additional information

Conditions and measures related to treatment of waste (including article waste)
See section 13 of the SDS. No additional information

Other conditions affecting environmental exposure
No additional information

2.2.2. Control of worker exposure: PROC11

PROC11	Non industrial spraying

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	
Maximum daily site tonnage	0.5
Duration of task	≤ 8 h/day
Exposure duration	Individual events, not totalling more than 1hour, per working day.

Technical and organisational conditions and measures
General ventilation
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
See section 8 of the SDS. Personal protection measures have to be applied in case of potential exposure only.

Other conditions affecting workers exposure
Indoor use

2.3. Exposure estimation and reference to its source

2.3.1. Environmental release and exposure: ERC8a

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

2.3.2. Worker exposure: PROC11

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Acute - Local - Inhalation	158 mg/m³	Indoor use, General ventilation, Without LEV, ConsExpo	

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

2.4.1. Environment

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

2.4.2. 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 : ConsExpo model available at: http://www.rivm.nl/en/Topics/Topics/C/ConsExpo/Spray_model

End of document