

Danger**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1. Product identifier**

Trade name : Nitrous oxide (refrigerated)
SDS no : RS-N2O-093B
Chemical description : Nitrous oxide (refrigerated)
CAS No : 10024-97-2
EC No : 233-032-0
EC Index No : ---
Registration-No. : 01-2119970538-25
Chemical formula : N2O

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
Laboratory use
Chemical reaction / Synthesis
Aerosol propellant
Use for manufacture of electronic/photovoltaic components
Contact supplier for more information on uses

Uses advised against : Do not inhale product on purpose because of the risk of asphyxiation

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	Ox. Gas 1	H270
	Press. Gas (Ref. Liq.)	H281
Health hazards	STOT SE 3	H336

Full text of H-statements see section 16.

2.2. Label elements

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

Hazard pictograms (CLP) :



Signal word (CLP) :

Danger

Hazard statements (CLP) :

H270 - May cause or intensify fire; oxidizer
 H281 - Contains refrigerated gas; may cause cryogenic burns or injury
 H336 - May cause drowsiness or dizziness.

Precautionary statements (CLP)

- Prevention : P220 - Keep/Store away from combustible materials
 P261 - Avoid breathing mist
 P271 - Use only outdoors or in a well-ventilated area
 P282 - Wear cold insulating gloves, eye protection, face protection
 P244 - Keep valves and fittings free from oil and grease
- Response : P370+P376 - In case of fire: stop leak if safe to do so
 P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing
 P312 - Call a doctor if you feel unwell
 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
 P403+P233 - Store in a well-ventilated place. Keep container tightly closed
 P405 - Store locked up
- Disposal considerations : P501 - Dispose of contents/container to Collection point

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]
Nitrous oxide (refrigerated)	(CAS No) 10024-97-2 (EC No) 233-032-0 (EC Index No) --- (Registration-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.

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
 For liquid spillage - flush with water for at least 15 minutes
- 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
In low concentrations may cause narcotic effects. Symptoms may include dizziness, headache, nausea and loss of co-ordination

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
Supports combustion
Hazardous combustion products : If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition:
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
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 : 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

: Try to stop release
Evacuate area
Monitor concentration of released product
Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe
Eliminate ignition sources
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
- Keep area evacuated and free from ignition sources until any spilled liquid has evaporated (ground free from frost)

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
- Consult supplier for specific recommendations
- Consider pressure relief device(s) in gas installations
- Ensure the complete gas system was (or is regularly) checked for leaks before use
- Do not smoke while handling product
- Use no oil or grease
- 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
- Keep away from ignition sources (including static discharges)
- Do not breathe gas
- Avoid release of product into atmosphere
- 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.org> and consult your supplier
- 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
- Clean all surfaces in direct contact with nitrous oxide as for oxygen service
- Nitrous oxide transfer pumps shall be provided with an interlock to prevent dry running
- Use self-limiting heating devices. Direct contact electric immersion heaters are not allowed.

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
- Do not remove or deface labels provided by the supplier for the identification of the cylinder contents
- Open valve slowly to avoid pressure shock.

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
- Segregate from flammable gases and other flammable materials in store
- 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

Nitrous oxide (refrigerated) (10024-97-2)		
OEL : Occupational Exposure Limits		
Austria	TWA (AT) OEL 8h [mg/m ³]	180 mg/m ³
	STEL (AT) OEL 15min [ppm]	400 ppm (15' Miw / 4x)
	STEL (AT) OEL 15min [mg/m ³]	720 mg/m ³ (15' Miw / 4x)
	TWA (AT) OEL 8h [ppm]	100 ppm
Belgium	TWA (BE) OEL 8h [mg/m ³]	91 mg/m ³
	TWA (BE) OEL 8h [ppm]	50 ppm
Estonia	TWA (EE) OEL 8h [mg/m ³]	180 mg/m ³
	TWA (EE) OEL 8h [ppm]	100 ppm
	STEL (EE) OEL 15min [mg/m ³]	900 mg/m ³
	STEL (EE) OEL 15min [ppm]	500 ppm
Germany	TWA (DE) OEL 8h [mg/m ³] TRGS 900	180 mg/m ³
	TWA (DE) OEL 8h [ppm] TRGS 900	100 ppm
	Peak exposure limitation factor (DE) OEL TRGS 900	2
Spain	TWA (ES) OEL 8h [mg/m ³]	92 mg/m ³
	TWA (ES) OEL 8h [ppm]	50 ppm
United Kingdom	WEL - LTEL - UK [mg/m ³]	183 mg/m ³
	WEL - LTEL - UK [ppm]	100 ppm
Czech Republic	TWA (CZ) OEL 8h [mg/m ³]	180 mg/m ³
	TWA (CZ) OEL 8h [ppm]	100 ppm
	STEL (CZ) OEL 15min [mg/m ³]	360 mg/m ³
	STEL (CZ) OEL 15min [ppm]	200 ppm
Denmark	TWA (DK) OEL 8h [mg/m ³]	90 mg/m ³
	TWA (DK) OEL 8h [ppm]	50 ppm
Finland	TWA (FI) OEL 8h [mg/m ³]	180 mg/m ³
	TWA (FI) OEL 8h [ppm]	100 ppm
Hungary	TWA (HU) OEL 8h [mg/m ³]	180 mg/m ³
	STEL (HU) OEL 15min [mg/m ³]	720 mg/m ³
Ireland	OEL (IE)-(8-hour reference period) [mg/m ³]	90 mg/m ³
	OEL (IE)-(8-hour reference period) [ppm]	50 ppm
Lithuania	TWA (LT) OEL 8h [mg/m ³]	180 mg/m ³
	TWA (LT) OEL 8h [ppm]	100 ppm
	STEL (LT) OEL 15min [mg/m ³]	900 mg/m ³
	STEL (LT) OEL 15min [ppm]	500 ppm
Norway	TWA (NO) OEL 8h [mg/m ³]	90 mg/m ³
	TWA (NO) OEL 8h [ppm]	50 ppm
Poland	TWA (PL) OEL 8h [mg/m ³]	90 mg/m ³
Slovakia	Maximum permissible exposure limit, average, 8h (SK) [mg/m ³]	183 mg/m ³
	Maximum permissible exposure limit, average, 8h (SK) [ppm]	100 ppm
Sweden	TWA (SV) OEL 8h [mg/m ³]	180 mg/m ³
	TWA (SV) OEL 8h [ppm]	100 ppm
	STEL (SV) OEL 15min [mg/m ³]	900 mg/m ³
	STEL (SV) OEL 15min [ppm]	500 ppm
Portugal	TWA (PT) OEL 8h [ppm]	50 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)
- 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:
 - 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

- : 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

- : None necessary

• Thermal hazards

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

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.

Odour threshold : Odour threshold is subjective and inadequate to warn of overexposure.

pH value : Not applicable.

Molar mass : 44 g/mol

Melting point : -90.81 °C

Boiling point : -88.5 °C

Flash point : Not applicable for gases and gas mixtures.

Critical temperature [°C] : 36.4 °C

Evaporation rate (ether=1) : Not applicable for gases and gas mixtures.

Flammability range : Non flammable.

Vapour pressure [20°C] : 50.8 bar(a)

Vapour pressure [50°C] : Not applicable.

Relative density, gas (air=1) : 1.5

Relative density, liquid (water=1) : 1.2

Solubility in water	: 1500 mg/l
Partition coefficient n-octanol/water [log Kow]	: 0.4
Auto-ignition temperature	: Not applicable.
Viscosity [20°C]	: Not applicable.
Explosive Properties	: Not applicable
Oxidising Properties	: Oxidiser
- Coefficient of oxygen equivalency (Ci)	: 0.6

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
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
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

10.3. Possibility of hazardous reactions

: Violently oxidises organic material
May react violently with reducing agents

10.4. Conditions to avoid

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

10.5. Incompatible materials

: For additional information on compatibility refer to ISO 11114

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 toxicological effects

Acute toxicity	: Classification criteria are not met Inhalation causes narcotic effects
----------------	---

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	: Classification criteria are not met, Reduced fertility in occupationally exposed personnel (healthcare) has been reported in some epidemiological studies. The effect was related to repeated exposure to levels of nitrous oxide above the specified occupational exposure limits in inadequately ventilated rooms
Toxic for reproduction : unborn child	: No known effects from this product

STOT-single exposure	: No known effects from this product
STOT-repeated exposure	: Classification criteria are not met At low concentrations: Neurologic effect Hemotoxic effect
Target organ(s)	: Erythrocytes Kidneys liver Central nervous system
Aspiration hazard	: Not applicable for gases and gas mixtures
Potential adverse human health effects and symptoms	: Fatal if inhaled.
Other information	: Likely routes of exposure: inhalation.

SECTION 12: Ecological information

12.1. Toxicity

Assessment : Classification criteria are not met.

12.2. Persistence and degradability

Assessment : Not applicable for inorganic gases. Study scientifically unjustified.

12.3. Bioaccumulative potential

Assessment : Product / Substance is a gas. Not expected to bioaccumulate due to the low log Kow (log Kow < 4). Refer to section 9. Partition into water is unlikely.

12.4. Mobility in soil

Assessment : Product / Substance is a gas. 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. Other adverse effects

: Can cause frost damage to vegetation.

Effect on the ozone layer : None

Global warming potential [CO₂=1] : 298

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

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
Ensure that the emission levels from local regulations or operating permits are not exceeded
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 04 *: Gases in pressure containers (including halons) containing dangerous substances

13.2. Additional information

: None

SECTION 14: Transport information**14.1. UN number**

UN-No. : 2201

14.2. UN proper shipping name**Transport by road/rail (ADR/RID)** : 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 (ADR/RID)**Class : 2
Classification code : 30
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 air (ICAO-TI / IATA-DGR)**

Class / Div. (Sub. risk(s)) : 2.2 (5.1)

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 (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 : 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 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) : Covered

National regulations

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

Water hazard class (WGK) : 1 - low hazard to waters

Kenn-Nr. : 767

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 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

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
H270	May cause or intensify fire; oxidizer
H281	Contains refrigerated gas; may cause cryogenic burns or injury
H336	May cause drowsiness or dizziness

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 document