

**Danger**



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

#### 1.1. Product identifier

Trade name : Nitrous oxide (refrigerated)  
SDS no : ALM/SDS/368  
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 : N<sub>2</sub>O

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

Relevant identified uses : Test gas/Calibration gas.  
Chemical reaction / Synthesis.  
Aerosol propellant.  
Use for manufacture of electronic/photovoltaic components.  
Laboratory use.  
Food applications.  
Industrial and professional. Perform risk assessment prior to use.  
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 : AIR LIQUIDE MALAYSIA SDN. BHD.  
Lot PT 2317, No. 21, Jalan PTB 1 Kawasan Perindustrian Tangga Batu, Mukim Sungai Udang,  
76400 Melaka - Malaysia

#### 1.4. Emergency telephone number

Emergency telephone number : +606-3513512

### 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 combustible materials.

P244 - Keep valves and fittings free from oil and grease.

P260 - Do not breathe gas, vapours.

P282 - Wear cold insulating gloves and either face shield or eye protection. cold insulating gloves, face shield, eye protection.

- Response : P304+P340+P315 - IF INHALED : Remove person to fresh air and keep comfortable for breathing. Get immediate medical advice.

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 - Store in a well-ventilated place.

### 2.3. Other hazards

: None.

## 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.

### 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. Perform cardiopulmonary resuscitation 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 low concentrations may cause narcotic effects. Symptoms may include dizziness, headache, nausea and loss of co-ordination.  
Refer to section 11.

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

: Obtain medical assistance.

**SECTION 5: Firefighting 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 : 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 : If leaking do not spray water onto container. Water surrounding area (from protected position) to contain fire.  
Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.  
If possible, stop flow of product.  
Use water spray or fog to knock down fire fumes if possible.  
Move containers away from the fire area if this can be done without risk.  
Special protective equipment for fire fighters : 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.  
Ensure adequate air ventilation.  
Use protective clothing.  
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.
- 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

- : Keep equipment free from oil and grease. For more guidance, refer to the EIGA Doc. 33 - Cleaning of Equipment for Oxygen Service downloadable at <http://www.eiga.eu>.
- Use no oil or grease.
- 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.
- 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.
- 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 regularly) 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.
- Do not breathe gas.
- Avoid release of product into work area.

Safe handling of the gas receptacle : Refer to supplier's container handling instructions.

Do not allow backfeed into the container.

Protect cylinders 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 cylinder 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 cylinder contents.

Suck back of water into the container must be prevented.

Open valve slowly to avoid pressure shock.

### **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.

### **7.3. Specific end use(s)**

: None.

## **SECTION 8: Exposure controls/personal protection**

### **8.1. Control parameters**

<b>Nitrous oxide (refrigerated) (10024-97-2)</b>		
OEL : Occupational Exposure Limits		
ACGIH	ACGIH TWA (ppm)	50 ppm
	Remark (ACGIH)	CNS impair; hematologic eff
	Regulatory reference	ACGIH 2017

DNEL (Derived-No Effect Level) : None established.

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

### **8.2. Exposure controls**

**8.2.1. Appropriate engineering controls**

- : Provide adequate general and local exhaust ventilation.
- Consider the use of a work permit system e.g. for maintenance activities.
- Product to be handled in a closed system.
- Gas detectors should be used when oxidising gases may be released.
- Systems under pressure should be regularly checked for leakages.
- Ensure exposure is below occupational exposure limits (where available).

**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 cold insulating gloves when transfilling or breaking transfer connections.  
Standard EN 511 - Cold insulating gloves.  
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

- : 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.  
Consult respiratory device supplier's product information for the selection of the appropriate device.  
Gas filters do not protect against oxygen deficiency.  
Standard EN 14387 - Gas filter(s), combined filter(s) and standard EN136, full face masks .  
Keep self contained breathing apparatus readily available for emergency use.  
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.  
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

## • 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 : Liquid
- Colour : Colourless liquid.

## Odour

- : Sweetish. Poor warning properties at high concentrations.

## Odour threshold

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

## pH

- : Not applicable for gases and gas mixtures.

Melting point / Freezing point	: -90.81 °C
Boiling point	: -88.5 °C
Flash point	: Not applicable for gases and gas mixtures.
Evaporation rate	: Not applicable for gases and gas mixtures.
Flammability (solid, gas)	: Non flammable.
Explosive limits	: Non flammable.
Vapour pressure [20°C]	: 50.8 bar(a)
Vapour pressure [50°C]	: Not applicable.
Vapour density	: Not applicable.
Relative density, liquid (water=1)	: 1.2
Relative density, gas (air=1)	: 1.5
Water solubility	: 1500 mg/l
Partition coefficient n-octanol/water (Log Kow)	: 0.4
Auto-ignition temperature	: Non flammable.
Decomposition temperature	: Not applicable.
Viscosity, kinematic	: No reliable data available.
Explosive properties	: Not applicable.
Oxidising properties	: Oxidiser.

**9.2. Other information**

Molar mass	: 44 g/mol
Critical temperature [°C]	: 36.4 °C
- Coefficient of oxygen equivalency (Ci)	: 0.6
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.

**10.3. Possibility of hazardous reactions**

: Violently oxidises organic material.

May react violently with reducing agents.

**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.
- Keep equipment free from oil and grease. For more guidance, refer to the EIGA Doc. 33 - Cleaning of Equipment for Oxygen Service downloadable at <http://www.eiga.eu>.
- 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.
- 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** : Inhalation causes narcotic effects.

LC50 inhalation rat (ppm)	500000 ppm/4h
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**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** : 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.

**SECTION 12: Ecological information****12.1. Toxicity**

Assessment : No ecological damage caused by this product.

EC50 48h - Daphnia magna [mg/l] : Study scientifically unjustified.

EC50 72h - Algae [mg/l] : Study scientifically unjustified.

LC50 96 h - Fish [mg/l] : Study scientifically unjustified.

**12.2. Persistence and degradability**

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



**12.3. Bioaccumulative potential**

Assessment : Not expected to bioaccumulate due to the low log Kow (log Kow < 4).  
Refer to 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. Other adverse effects**

Other adverse effects : Can cause frost damage to vegetation.  
Effect on the ozone layer : None.  
Global warming potential [CO<sub>2</sub>=1] : 298  
Effect on global warming : Contains greenhouse gas(es).  
When discharged in large quantities may contribute to the greenhouse effect.

**SECTION 13: Disposal considerations****13.1. Waste treatment methods**

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 "Disposal of Gases", downloadable at <http://www.eiga.eu> for more guidance on suitable disposal 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.  
Return unused product in original cylinder 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**

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 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.

**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.

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 : None.

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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