

SAFETY DATA SHEET

Nitrogen Dioxide

Issue Date: 16.01.2013
Last revised date: 15.06.2015

Version: 1.0

SDS No.: 000010021798
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Skin corrosion Category 1B H314: Causes severe skin burns and eye damage.
Serious eye damage Category 1 H318: Causes serious eye damage.

2.2 Label Elements

Contains: nitrogen dioxide



Signal Words: Danger

Hazard Statement(s): H270: May cause or intensify fire; oxidiser.
H280: Contains gas under pressure; may explode if heated.
H314: Causes severe skin burns and eye damage.
H330: Fatal if inhaled.

Precautionary Statement

Prevention: P220: Keep/Store away from combustible materials.
P244: Keep valves and fittings free from oil and grease.
P260: Do not breathe gas/vapours.
P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response: P303+P361+P353+P315: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower. Get immediate medical advice/attention.
P304+P340+P315: IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get immediate medical advice/attention.
P305+P351+P338+P315: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. 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.
P405: Store locked up.

Disposal: None.

Supplemental label information

EUH071: Corrosive to the respiratory tract.

2.3 Other hazards: Contact with evaporating liquid may cause frostbite or freezing of skin.

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SECTION 3: Composition/information on ingredients

3.1 Substances

Chemical name	nitrogen dioxide
INDEX No.:	007-002-00-0
CAS-No.:	10102-44-0
EC No.:	233-272-6
REACH Registration No.:	Not available.
Purity:	100 % The purity of the substance in this section is used for classification only, and does not represent the actual purity of the substance as supplied, for which other documentation should be consulted.
Trade name:	-

SECTION 4: First Aid Measures

General: Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

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.

Eye contact: Rinse the eye with water immediately. Remove contact lenses, if present and easy to do. Continue rinsing. Flush thoroughly with water for at least 15 minutes. Get immediate medical assistance. If medical assistance is not immediately available, flush an additional 15 minutes.

Skin Contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Contact with evaporating liquid may cause frostbite or freezing of skin.

Ingestion: Ingestion is not considered a potential route of exposure.

4.2 Most important symptoms and effects, both acute and delayed: Causes severe skin burns and eye damage. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling. May be fatal if inhaled. May result in pulmonary oedema

4.3 Indication of any immediate medical attention and special treatment needed

Hazards: Causes severe skin burns and eye damage. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling. May be fatal if inhaled. May result in pulmonary oedema

Treatment: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention. Treat with a corticosteroid spray as soon as possible after inhalation.

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SECTION 5: Firefighting Measures

General Fire Hazards: Heat may cause the containers to explode.

5.1 Extinguishing media

Suitable extinguishing media: Use water spray to reduce vapours or divert vapour cloud drift. Water Spray or Fog. Dry powder. Foam. Carbon dioxide.

Unsuitable extinguishing media: None.

5.2 Special hazards arising from the substance or mixture:

Fire or excessive heat may produce hazardous decomposition products.

Hazardous Combustion Products:

If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: Nitrogen monoxide

5.3 Advice for firefighters

Special fire fighting procedures:

In case of fire: Stop leak if safe to do so. Use of water may result in the formation of very toxic aqueous solutions. Keep run-off water out of sewers and water sources. Dyke for water control. Continue water spray from protected position until container stays cool. Use extinguishants to contain the fire. Isolate the source of the fire or let it burn out.

Special protective equipment for firefighters:

Gas tight chemically protective clothing (Type 1) in combination with self contained breathing apparatus.
Guideline: EN 943-2 Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Performance requirements for gas-tight (Type 1) chemical protective suits for emergency teams (ET)

SECTION 6: Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures:

Evacuate area. Eliminate all ignition sources if safe to do so. Provide adequate ventilation. Monitor the concentration of the released product. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.

6.2 Environmental Precautions:

Prevent further leakage or spillage if safe to do so. Reduce vapour with fog or fine water spray. Keep run-off water out of sewers and water sources. Dyke for water control.

6.3 Methods and material for containment and cleaning up:

Provide adequate ventilation. Wash contaminated equipment or sites of leaks with copious quantities of water.

6.4 Reference to other sections:

Refer to sections 8 and 13.

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SECTION 7: Handling and Storage:

7.1 Precautions for safe handling:

Only experienced and properly instructed persons should handle gases under pressure. Avoid exposure - obtain special instructions before use. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Keep equipment free from oil and grease. Open valve slowly to avoid pressure shock. Use only oxygen approved lubricants and sealants. Use only with equipment cleaned for oxygen service and rated for the pressure. Installation of a cross purge assembly between the container and the regulator is recommended. Excess pressure must be vented through an appropriate scrubber system. Refer to supplier's handling instructions. The substance must be handled in accordance with good industrial hygiene and safety procedures. Protect containers from physical damage; do not drag, roll, slide or drop. Do not remove or deface labels provided by the supplier for the identification of the container contents. When moving containers, even for short distances, use appropriate equipment eg. trolley, hand truck, fork truck etc. Secure cylinders in an upright position at all times, close all valves when not in use. Provide adequate ventilation. Suck back of water into the container must be prevented. Do not allow backfeed into the container. Avoid suckback of water, acid and alkalis. Keep container below 50°C in a well ventilated place. Observe all regulations and local requirements regarding storage of containers. When using do not eat, drink or smoke. Store in accordance with local/regional/national/international regulations. Never use direct flame or electrical heating devices to raise the pressure of a container. 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. Damaged valves should be reported immediately to the supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Keep container valve outlets clean and free from contaminants particularly oil and water. If user experiences any difficulty operating container valve discontinue use and contact supplier. Never attempt to transfer gases from one container to another. Container valve guards or caps should be in place.

7.2 Conditions for safe storage, including any incompatibilities:

Containers should not be stored in conditions likely to encourage corrosion. Keep away from food, drink and animal feeding stuffs. Stored containers should be periodically checked for general conditions and leakage. Container valve guards or caps should be in place. Store containers in location free from fire risk and away from sources of heat and ignition. Keep away from combustible material. Avoid asphalted locations for storage, transfer and use (ignition risk if spilt). Segregate from flammable gases and other flammable materials being stored.

7.3 Specific end use(s):

None.

SECTION 8: Exposure Controls/Personal Protection

8.1 Control Parameters

Occupational Exposure Limits

None of the components have assigned exposure limits.

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8.2 Exposure controls

Appropriate engineering controls:

Consider a work permit system e.g. for maintenance activities. Ensure adequate air ventilation. Provide adequate general and local exhaust ventilation. Keep concentrations well below occupational exposure limits. Gas detectors should be used when toxic quantities may be released. Gas detectors should be used when quantities of oxidising gases may be released. Avoid oxygen rich (>23,5%) atmospheres. Systems under pressure should be regularly checked for leakages. Product to be handled in a closed system and under strictly controlled conditions. Use only permanent leak tight installations (e.g. welded pipes). Do not eat, drink or smoke when using the product.

Individual protection measures, such as personal protective equipment

General information:

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. Keep self contained breathing apparatus readily available for emergency use. Keep suitable chemically resistant protective clothing readily available for emergency use. Personal protective equipment for the body should be selected based on the task being performed and the risks involved. Protect eyes, face and skin from contact with product. Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

Eye/face protection:

Safety eyewear, goggles or face-shield to EN166 should be used to avoid exposure to liquid splashes. Wear eye protection to EN 166 when using gases. Guideline: EN 166 Personal Eye Protection.

Skin protection

Hand Protection:

Wear working gloves while handling containers
Guideline: EN 388 Protective gloves against mechanical risks.
Chemically resistant gloves complying with EN 374 should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Guideline: EN 374-1/2/3 Protective gloves against chemicals and micro-organisms.
Material: Polyvinyl chloride (PVC).
Break-through time: > 60 min

Body protection:

No special precautions.

Other:

Wear safety shoes while handling containers
Guideline: ISO 20345 Personal protective equipment - Safety footwear.

Respiratory Protection:

Reference should be made to European Standard EN 689 for methods for the assessment of exposure by inhalation to chemical agents and national guidance documents for methods for the determination of hazardous substances. The selection of the Respiratory Protective Device (RPD) must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected RPD.

Thermal hazards:

No precautionary measures are necessary.

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Hygiene measures: Obtain special instructions before use. Specific risk management measures are not required beyond good industrial hygiene and safety procedures. Do not eat, drink or smoke when using the product.

Environmental exposure controls: For waste disposal, see section 13.

SECTION 9: Physical And Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state:	Gas
Form:	Liquefied gas
Colour:	Brown
Odour:	Pungent acrid odour
Odour Threshold:	Odour threshold is subjective and is inadequate to warn of over exposure.
pH:	not applicable.
Melting Point:	-11.2 °C
Boiling Point:	21.15 °C
Sublimation Point:	not applicable.
Critical Temp. (°C):	158.0 °C
Flash Point:	Not applicable to gases and gas mixtures.
Evaporation Rate:	Not applicable to gases and gas mixtures.
Flammability (solid, gas):	Noncombustible Liquid/Gas, but will accelerate the burning of combustible materials
Flammability limit - upper (%)-:	not applicable.
Flammability limit - lower(%)-:	not applicable.
Vapour pressure:	121.05456 kPa (25 °C)
Vapour density (air=1):	2.8
Relative density:	1.448 (20 °C) 4 °C
Solubility(ies)	
Solubility in Water:	Completely soluble
Partition coefficient (n-octanol/water):	Not known.
Autoignition Temperature:	not applicable.
Decomposition Temperature:	When heated to decomp, emits toxic fumes of nitroxides.
Viscosity	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0.42 mPa.s (26.8 °C)
Explosive properties:	Not applicable.
Oxidising Properties:	Oxidising

9.2 Other information:

Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

Molecular weight: 46.01 g/mol (NO₂)

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SECTION 10: Stability and Reactivity

- 10.1 Reactivity:** No reactivity hazard other than the effects described in sub-section below.
- 10.2 Chemical Stability:** Stable under normal conditions.
- 10.3 Possibility of Hazardous Reactions:** Violently oxidises organic material. May react violently with combustible materials. May react violently with reducing agents. May react violently with alkalis.
- 10.4 Conditions to Avoid:** Avoid moisture in the installation.
- 10.5 Incompatible Materials:** Moisture. Combustible materials Reducing Agents. Keep equipment free from oil and grease. For material compatibility see latest version of ISO-11114. Consider the potential toxicity hazard due to the presence of chlorinated or fluorinated polymers in high pressure (>30 bar) oxygen lines and equipment in case of combustion. Reacts with water to form corrosive acids.
- 10.6 Hazardous Decomposition Products:** Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological Information

General information: None.

11.1 Information on toxicological effects

Acute toxicity - Oral Product Based on available data, the classification criteria are not met.

Acute toxicity - Dermal Product Based on available data, the classification criteria are not met.

Acute toxicity - Inhalation Product Fatal if inhaled.

nitrogen dioxide LC 50 (Rat, 4 h): 88 ppm
LC 50 (Rat, 1.0 h): 115 ppm

Skin Corrosion/Irritation Product Causes severe burns.

Serious Eye Damage/Eye Irritation Product Causes serious eye damage.

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Respiratory or Skin Sensitisation	
Product	Based on available data, the classification criteria are not met.
Germ Cell Mutagenicity	
Product	Based on available data, the classification criteria are not met.
Carcinogenicity	
Product	Based on available data, the classification criteria are not met.
Reproductive toxicity	
Product	Based on available data, the classification criteria are not met.
Specific Target Organ Toxicity - Single Exposure	
Product	Based on available data, the classification criteria are not met.
Specific Target Organ Toxicity - Repeated Exposure	
Product	Based on available data, the classification criteria are not met.
Aspiration Hazard	
Product	Not applicable to gases and gas mixtures..

SECTION 12: Ecological Information

12.1 Toxicity

Acute toxicity	
Product	No ecological damage caused by this product.
Acute toxicity - Fish	
nitrogen dioxide	LC 50 (Tench (Tinca tinca), 24 h): 41.2 mg/l (Renewal) Remarks: Mortality
Acute toxicity - Aquatic Invertebrates	
nitrogen dioxide	LC 50 (Rotifer (Brachionus plicatilis), 48 h): 360 - 403 mg/l (Static) Remarks: Mortality

12.2 Persistence and Degradability

Product Not applicable to gases and gas mixtures..

12.3 Bioaccumulative Potential

Product The product is expected to biodegrade and is not expected to persist for long periods in an aquatic environment.

12.4 Mobility in Soil

Product Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5 Results of PBT and vPvB assessment

Product Not classified as PBT or vPvB.

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10/14**12.6 Other Adverse Effects:** No ecological damage caused by this product.**SECTION 13: Disposal Considerations****13.1 Waste treatment methods****General information:** Must not be discharged to atmosphere. Consult supplier for specific recommendations.**Disposal methods:** Refer to the EIGA code of practice (Doc.30 "Disposal of Gases", downloadable at <http://www.eiga.org>) for more guidance on suitable disposal methods. Dispose of container via supplier only. Discharge, treatment, or disposal may be subject to national, state, or local laws. Gas may be scrubbed in alkaline solution under controlled conditions to avoid violent reaction.**European Waste Codes****Container:** 16 05 04*: gases in pressure containers (including halons) containing dangerous substances**SECTION 14: Transport Information****ADR**14.1 UN Number: UN 1067
14.2 UN Proper Shipping Name: NITROGEN DIOXIDE
14.3 Transport Hazard Class(es)
Class: 2
Label(s): 2.3, 5.1, 8
Hazard No. (ADR): 265
Tunnel restriction code: (C/D)
Emergency Action Code: 2PE
14.4 Packing Group: -
14.5 Environmental hazards: not applicable
14.6 Special precautions for user: -**RID**14.1 UN Number: UN 1067
14.2 UN Proper Shipping Name: NITROGEN DIOXIDE
14.3 Transport Hazard Class(es)
Class: 2
Label(s): 2.3, 5.1, 8
14.4 Packing Group: -
14.5 Environmental hazards: not applicable
14.6 Special precautions for user: -

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IMDG

14.1 UN Number: UN 1067
14.2 UN Proper Shipping Name: NITROGEN DIOXIDE
14.3 Transport Hazard Class(es)
Class: 2.3
Label(s): 2.3, 5.1, 8
EmS No.: F-C, S-W
14.3 Packing Group: -
14.5 Environmental hazards: not applicable
14.6 Special precautions for user: -

IATA

14.1 UN Number: UN 1067
14.2 Proper Shipping Name: Nitrogen dioxide
14.3 Transport Hazard Class(es):
Class: 2.3
Label(s): -
14.4 Packing Group: -
14.5 Environmental hazards: not applicable
14.6 Special precautions for user: -
Other information
Passenger and cargo aircraft: Forbidden.
Cargo aircraft only: Forbidden.

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: not applicable

Additional identification:

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 that they are firmly secured. Ensure that the container valve is closed and not leaking. Container valve guards or caps should be in place. Ensure adequate air ventilation.

SECTION 15: Regulatory information

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

EU Regulations

Directive 96/61/EC: concerning integrated pollution prevention and control (IPPC): Article 15, European Pollution Emission Registry (EPER):

Chemical name	CAS-No.	Concentration
nitrogen dioxide	10102-44-0	100 %

Directive 96/82/EC (Seveso II): on the control of major accident hazards involving dangerous substances:

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Chemical name	CAS-No.	Concentration
nitrogen dioxide	10102-44-0	100 %

Directive 98/24/EC on the protection of workers from the risks related to chemical agents at work:

Chemical name	CAS-No.	Concentration
nitrogen dioxide	10102-44-0	100 %

National Regulations

Management of Health and Safety at Work Regulations (1999 No. 3242). The Regulatory Reform (Fire Safety) Order 2005 (2005 No. 1541). Control of Substances Hazardous to Health Regulations (COSHH, 2002 No. 2677). Provision and Use of Work Equipment Regulations (PUWER, 1998 No. 2306). Personal Protective Equipment Regulations (1992 No. 2966). Control of Major Accident Hazards Regulations (COMAH, 2015 No. 483). Pressure Systems Safety Regulations (PSSR, 2000 No. 128). Only products that comply with the food regulations (EC) No. 1333/2008 and (EU) No. 231/2012 and are labelled as such may be used as food additives.
This Safety Data Sheet has been produced to comply with Regulation (EU) 453/2010.

15.2 Chemical safety assessment:

No Chemical Safety Assessment has been carried out.

SECTION 16: Other Information

Revision Information:

Not relevant.

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Key literature references and sources for data:

Various sources of data have been used in the compilation of this SDS, they include but are not exclusive to:

- Agency for Toxic Substances and Diseases Registry (ATSDR) (<http://www.atsdr.cdc.gov/>).
- European Chemical Agency: Guidance on the Compilation of Safety Data Sheets.
- European Chemical Agency: Information on Registered Substances <http://apps.echa.europa.eu/registered/registered-sub.aspx#search>
- European Industrial Gases Association (EIGA) Doc. 169 Classification and Labelling guide.
- International Programme on Chemical Safety (<http://www.inchem.org/>)
- ISO 10156:2010 Gases and gas mixtures - Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets.
- Matheson Gas Data Book, 7th Edition.
- National Institute for Standards and Technology (NIST) Standard Reference Database Number 69.
- The ESIS (European chemical Substances 5 Information System) platform of the former European Chemicals Bureau (ECB) ESIS (<http://ecb.jrc.ec.europa.eu/esis/>).
- The European Chemical Industry Council (CEFIC) ERICards.
- United States of America's National Library of Medicine's toxicology data network TOXNET (<http://toxnet.nlm.nih.gov/index.html>)
- Threshold Limit Values (TLV) from the American Conference of Governmental Industrial Hygienists (ACGIH).
- Substance specific information from suppliers.

Details given in this document are believed to be correct at the time of publication.
EH40 (as amended) Workplace exposure limits.

Wording of the R-phrases and H-statements in sections 2 and 3

H270	May cause or intensify fire; oxidiser.
H280	Contains gas under pressure; may explode if heated.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H330	Fatal if inhaled.
R8	Contact with combustible material may cause fire.
R26	Very toxic by inhalation.
R34	Causes burns.

Training information:

Users of breathing apparatus must be trained. Ensure operators understand the toxicity hazard. Ensure operators understand the hazards.

Classification according to Regulation (EC) No 1272/2008 as amended.

Ox. Gas 1, H270
Press. Gas Liq. Gas, H280
Acute Tox. 1, H330
Skin Corr. 1B, H314
Eye Dam. 1, H318

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Other information:

Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. Ensure adequate air ventilation. Ensure all national/local regulations are observed. 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. Note: When the Product Name appears in the SDS header the decimal sign and its position comply with rules for the structure and drafting of international standards, and is a comma on the line. As an example 2,000 is two (to three decimal places) and not two thousand, whilst 1.000 is one thousand and not one (to three decimal places).

Last revised date:

15.06.2015

Disclaimer:

This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.