

Material Safety Data Sheet

[Manufacturer Information]

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[Product Name]

Nitrogen (Industrial)

[Chemical Product Identification]

Chemical Name	Nitrogen
Content	99.99 V/V% min.
Chemical Formula	N ₂
Official Gazette Notice Reference No.	—
CAS No.	7727-37-9
UN Classification	Class 2 (high pressure gas)
UN No.	1066
EC No.	—

[Danger and Hazard Classification]

Classification Name	High pressure gas
Hazard	Simple suffocating property

[First-Aid Measures]

Skin Adhesion	Exposure to atmospheric nitrogen requires no medical treatment.
Eye Contact	Cool and see a doctor immediately if exposed to spouting gas.
Inhalation	Move to fresh air environment, loosen clothes, and keep warm at rest with blankets etc. If respiration is weakened, give oxygen inhalation containing pure oxygen or carbon dioxide 1.5 V/V% max. Oxygen gas is dry and humidification is preferable. If no respiration, give artificial respiration as far as possible and call a doctor.
Accidental Ingestion	—

[Fire-Fighting Measures]

Fire Extinguishing Method	Incombustible gas with no fear of a fire.
Fire Extinguishing Agents	- If containers are exposed to a fire, inner pressure elevates, safety device works, and nitrogen gas spouts. Containers may burst if inner pressure elevation is violent. Extinguish neighborhood fire, and cool containers with water spray from up wind as far as possible. - Containers may fly like rockets on occasions such as container valve breakage. - Cool containers with water to avoid container temperature elevation.

[Accidental Release Measures]

- Keep ventilation well to avoid suffocation risks.
- Wear positive pressure self-contained breathing apparatus when entering the release zone. Measure and control oxygen concentrations.

[Handling and Storage Considerations]

Laws and Regulations	Main laws and regulations applicable to handling etc. are the following:
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(Manufacture)	• High pressure gas manufacture (including filling containers) requires permits under High Pressure Gas Safety Law Article 5 Clause 1 Paragraph 1 or notifications under Article 5 Clause 2 Paragraph 1 of the same law. • Filling high pressure gas into containers requires compliance with High Pressure Gas Safety Law Article 48.
(Sale)	• High pressure gas sales business requires notifications under the four clauses of High Pressure Gas Safety Law Article 20.
(Storage)	• Storage of 3000 m³ or more of high pressure gas requires Class 1 storage installation permits under High Pressure Gas Safety Law Article 16. Storage of 300 m³ to below 3000 m³ of high pressure gas requires Class 2 storage installation notifications under High Pressure Gas Safety Law Article 17-2 and compliance with technical standards under Security Regulation for General High Pressure Gas Articles 18 and 22 (storage in tanks) and Article 23 (storage in containers). Storage of 0.15 m³ to below 300 m³ of high pressure gas requires compliance with Security Regulation for General High Pressure Gas Article 18.
(Transfer)	• High pressure gas transfer requires compliance with standards on measures and methods specified in Security Regulation for General High Pressure Gas Article 48 under High Pressure Gas Safety Law Article 23.
(Consumption)	• Container handling requires taking measures specified in Industrial Safety and Health Law Article 263. • High pressure gas must be handled by persons with experience and necessary education.
(Storage)	• Place filled containers and residual gas containers separately for container storage. • Store containers away from electric wiring and earth wires. • Place containers at well-drained well-ventilated dry places. • Avoid container exposure to corrosive atmospheres and serial vibration. • Keep containers away from direct sunlight and maintain temperature at 40°C or below. • Take measures against container falling, tumbling, etc. and avoid rough handling.
Handling (Suffocating Property)	Take care about the following in particular on handling: • Never use nitrogen at tightly closed or poorly ventilated places. Oxygen levels in the air drop. • Shut nitrogen supply piping valves or cocks or apply shutoff boards when operating in boilers, tanks, reaction towers, ship holds, etc. with nitrogen supply piping. Take measures including locking the shut valves or cocks or applied shutoff boards, and put “Don’t Open” warning in a prominent place. • Label the nitrogen name and open/shut directions on nitrogen

supply piping valves or cocks or operating switches, push-buttons, etc. to prevent nitrogen release due to their erroneous operation.

- For operations at places of insufficient wind draft or ventilation where nitrogen discharged from container safety valves etc. of tanks and reaction towers might flow out, take measures including installing devices capable of directly releasing outside the nitrogen discharged from the safety valves etc. to avoid nitrogen retention at the places.
 - Operations in boilers, tanks, ship holds, and other facilities that contain or had contained nitrogen come under operations at places of oxygen depletion danger under Industrial Safety and Health Law requiring appointment of oxygen depletion danger work foremen (Industrial Safety and Health Law Article 14). These places also come under work places requiring performance of work environment measurement (Industrial Safety and Health Law Article 65 Clause 1).
 - Never use nitrogen in place of compressed air or air.
- (High Pressure)
- Fix containers to avoid toppling. Containers may fly like rockets if high pressure nitrogen spouts because of container valve damage etc. in the case of toppling.
- (Others)
- Never touch nitrogen gas spouting at high pressure.
 - Before using containers, check the gas name by means of chop marks, paint colors (gray for nitrogen) and gas name labels on the containers. Don't use but return to dealers if contents differ from intended materials.
 - Remove before use attach/detach type protective caps.
 - Open or shut container valves slowly using the designated handle. Never strike with hammers etc. for the opening or shutting. If manual opening or shutting is impossible, return the valves to dealers with clear statements of the fact.
 - After removing the protective caps, open the container valves slightly for a short while to blow off dust adhering to gas outlets of the container valves taking care not to direct the outlets to persons.
 - Check things present at container valve screws and use them for installing pressure regulators.
 - Use pressure regulators without fail instead of direct use from containers.
 - After installing the pressure regulator correctly, turn counter-clockwise the pressure regulator handle of the pressure regulator, and then open the container valve gently. In this case, stand at the side, not the front or back, of the pressure regulator.
 - Check for leaks on joints, hoses, piping and instrument. Methods using effervescent solution like soap water are simple, safe and sure for leak spot checking.

- Shut the container valve without fail when leaving the work place after operation suspension or termination. Then, release nitrogen in the pressure regulator and loosen the pressure regulator handle.
- Containers should be filled only by persons licensed for the filling.
- Container repair and repainting, and removal, replacement, etc. of container valves and safety devices should be performed only at container testing places.
- Container chop marks, labels, etc. should not be altered, deleted or unnecessarily peeled off.
- Never use containers as part of electric circuits. In particular, never damage containers with arc strike generation etc. during arc welding.
- Keep containers away from flames and sparks, and from exposure to fire sparks etc. of gas cutting etc.
- Warm with warm water if container valve outlets freeze.
- Notify dealers of details of container marks, numbers, etc. if substances other than nitrogen are likely to have entered containers.
- Never use containers in place of rollers, molds, etc. for purposes other than their inherent purposes.
- On container delivery and receipt, designate container managers in advance for proper container management.
- Keep remaining container pressure at 0.1 MPa min. After use, shut the container valve securely, attach the protective cap, and return promptly to the residual gas container yard.
- Return to dealers promptly containers elapsing the contract period and used containers.

[Exposure Preventive Measures]

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| Standard Control Concentration
Permissible Concentration | <ul style="list-style-type: none"> • Keep oxygen levels in the air at 18 V/V% min. • ACGIH*: Simple suffocating gas, inert gas • Acts as a simple suffocating gas with no particular physiological action. Since danger determination criteria in this case are residual oxygen levels, no permissible concentration can be established for respective simple suffocating gases. Minimum oxygen level to secure in environments is 18 V/V% (corresponding to oxygen partial pressure 18.0 kPa) at normal pressure. Oxygen depleted air has no alerting effect and simple suffocating gases are mostly tasteless and odorless. |
| Facilities Measures
Protective Apparatus | <ul style="list-style-type: none"> • Keep ventilation well when using in indoor work places. |
| Skin | <ul style="list-style-type: none"> • No particular protective apparatus is required. Wear gloves when handling containers. |
| Eyes | <ul style="list-style-type: none"> • Wear protective eyeglasses. |

* ACGIH: American Conference of Governmental Industrial Hygienists

[Physical and Chemical Properties]

Appearance	Colorless gas
Specific Gravity	0.967 (air = 1, 25°C, 1 atm)
Melting Point	-209.9°C
Gas Density	1.25 kg/m ³ (0°C, 1 atm)
Odor	Odorless
Boiling Point	-195.8°C
Vapor Pressure	- - (- °C)
Solubility	Water: 1.557 cm ³ /100 gH ₂ O (20°C, 1 atm)

[Danger Information]

Flash Point	- - °C
Ignition Point	- - °C
Explosion Range	- - to - - V/V%
Safety and Reactivity	Stable, and non-reactive under normal conditions.
Others	Filling pressure is as high as 14.7–19.6 MPa. Direct blow of high pressure nitrogen on the human body may cause injury.

[Hazard Information]

Acute Toxicity	
Oral	- - mg/kg
Inhalation	- Has no toxicity but acts as a simple suffocating gas after replacement with air. Oxygen level 17 V/V% is the low level safety limit. Early stage oxygen depletion symptoms develop at oxygen level 17 V/V%. Symptoms of pulse and respiratory rate increase, mental concentration needing efforts, small muscular operation difficulty, headache, etc. develop at oxygen levels 16-12 V/V%. - Unconsciousness, CNS disorder, spasms, coma, and respiratory arrest develop followed by cardiac arrest 6-8 minutes later at oxygen levels 10-6 V/V%. - At extremely low levels of 6 V/V% or below, one breath instantly induces faint, coma, respiratory arrest and spasms followed by death in 6 minutes. - Cases of falls to death involved in spouting nitrogen are often seen during inspections in tanks after expelling flammable gas with nitrogen. Care should be taken about the danger of a breath of oxygen-free air of oxygen levels 6 V/V% or below.
Irritation	None
Sensitization	None
Mutagenicity	None
Subacute Toxicity	None

[Environmental Impact Information]

Ichthyotoxicity	Does not come under Class I and Class II specified chemical substances and designated chemical substances under Law
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Partition Coefficient	Concerning the Examination and Regulation of Manufacture, Etc. of Chemical Substances. • Does not come under Class I and Class II specified chemical substances and designated chemical substances under Law Concerning the Examination and Regulation of Manufacture, Etc. of Chemical Substances.
[Transport Information]	• High pressure gas transfer requires compliance with standards on measures and methods necessary to safety stipulated in Security Regulation for General High Pressure Gas Article 48 under High Pressure Gas Safety Law Article 23. • Shut container valves securely and install protective caps correctly for container transfer. • Fix containers with ropes etc. to avoid tumbling when keeping them standing upright for transfer or transport. • Avoid rough handling like hauling, toppling, falling, kicking, or giving shocks such as bumping hard against things. • Use of carriers exclusively for containers is preferable for transfer in work places. When using other vehicles for inevitable reasons, pay attention against direct contact of container protective caps and container valves with vehicle counters etc. • When transferring manually, slant containers slightly and roll them on bottom edges. • When transporting by transport vehicles on public roads or in work places, load containers so they do not stick out from the vehicle body, and fasten and fix them securely with ropes etc. to prevent falls. Avoid sharp turns at corners. • When unloading from transport vehicles, check protective cap screws and unload containers gently on buffer boards etc. • When hoisting containers for transfer, use “baskets” etc. capable of retaining them safely. Avoid direct application of sling ropes to container valves and protective caps. Avoid hoisting with magnet cranes. • High pressure gas transfer by vehicles requires posting alert labels at prominent places of the vehicles.
[Disposal Considerations]	• When disposing of nitrogen gas, open and shut container valves gently at outdoor places of good wind draft for risk-free disposal by small quantities. • Nitrogen gas disposal should exclude containers with remaining gas. • After disposal, shut container valves and take measures to avoid container tumbling and container valve damage. • Container discard should be done by container owners in accordance with laws and regulations and should not be done by users randomly.

[Regulatory Information]

High Pressure Gas Safety Law	Manufacture, sale, storage, transfer, consumption
Industrial Safety and Health Law	Manufacture, storage, consumption
Fire Service Law	Manufacture, storage, consumption
Ship Safety Law	Transfer
Port Regulations Law	Transfer
Civil Aeronautics Law	Transfer

[Others]

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| Application Range | <ul style="list-style-type: none">• This MSDS applies only to industrial nitrogen gas. Separate data apply to medical nitrogen. Separate safety data sheet applies to liquefied nitrogen.• Nitrogen is generally supplied in containers filled 14.7-19.6 MPa at 35°C and comes under “high pressure gas” under High Pressure Gas Safety Law Article 2. |
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References

- 1) Nihonsanso Co., Ltd., Matheson Gas Products Inc. Co-ed.: Gas Safe Handling Data Book
 - 2) C.G.A.: Accident Prevention in Oxygen-Rich and Oxygen-Deficient Atmospheres
 - 3) Oxygen Society: Handling Methods for Oxygen, Nitrogen and Argon
 - 4) Kikuo Oikawa: Dangerous and Hazardous Substance Profile 100 in Frontier Industry Technology
 - 5) The Chemical Society of Japan Ed.: Chemistry Handbook
 - 6) L'Air Liquide: Gas Encyclopedia
 - 7) Shinnippon-Hoki Publishing: Practical Industrial Safety and Health Handbook
 - 8) Japan Industrial Safety and Health Association: Oxygen Depleted Dangerous Work Foreman Text
 - 9) Japan Association for Working Environment Measurement: 1997 ACGIH TLVs of Chemical Substances and Physical Factors, BEIs of Chemical Substances
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[Handling of Description Matters]

- Description contents of this document have been prepared on the basis of currently available data and information but constitute no warranty whatever on the description data and valuation.
- The description matters cover normal handling. For special handling, take safety measures before use proper to new applications and methods.
- This document has been prepared in accordance with Notification No. 60 (of July 1, 1992) of the Ministry of Labour. Please refer to applicable laws and regulations, scientific literature and manufacturers' instruction manuals for further details.