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

1.1. Product identifier : Nitrogen (Refrigerated)

Chemical formula : N2

Synonyms : Nitrogen (refrigerated), Liquid Nitrogen, LIN, Cryogenic Liquid Nitrogen, Nitrogen

Refer to Section 3 for REACH information

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

Use of the Substance/Mixture : General Industrial

Restrictions on Use : No data available.

1.3. Details of the supplier of the safety data sheet : Air Products Ireland Ltd
Unit 950 Western Industrial Estate
Kileen Road
Dublin 12
Ireland

Email Address – Technical Information : GASTECH@airproducts.com

Telephone : 1-4659650

1.4. Emergency telephone number : (01) 463 4200 / +353 1 463 4200

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Gases under pressure - injury. Refrigerated liquefied gas H281:Contains refrigerated gas; may cause cryogenic burns or

2.2. Label elements

Hazard pictograms/symbols

Signal Word: Warning

Hazard Statements:

H281:Contains refrigerated gas; may cause cryogenic burns or injury.

Precautionary Statements:

Prevention	:	P282:Wear cold insulating gloves/face shield/eye protection.
Response	:	P315 :Get immediate medical advice/attention. P336 :Thaw frosted parts with lukewarm water. Do not rub affected area.
Storage	:	P403:Store in a well-ventilated place.

2.3. Other hazards

Extremely cold liquid and gas under pressure.
Direct contact with liquid can cause frostbite.
Can cause rapid suffocation.
Avoid breathing gas.
Self contained breathing apparatus (SCBA) may be required.

SECTION 3: Composition/information on ingredients

Substance/Mixture : Substance

Components	EINECS / ELINCS Number	CAS Number	Concentration (Volume)
Nitrogen	231-783-9	7727-37-9	100 %

Components	Classification (CLP)	REACH Reg. #
Nitrogen	Press. Gas (Ref. liq.) ;H281	

If REACH registration numbers do not appear the substance is either exempt from registration, does not meet the minimum volume threshold for registration, or the registration date has not yet come due.
Concentration is nominal. For the exact product composition, please refer to technical specifications.

SECTION 4: First aid measures

4.1. Description of first aid measures

General advice : 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 : In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Keep eye wide open while rinsing.

Skin contact : In case of frostbite, obtain medical treatment immediately. As soon as practical, place the affected area in a warm water bath- which has a temperature not to exceed 40 °C (105 °F). Do not rub frozen parts as tissue damage may result. Cover wound with sterile dressing.

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

Inhalation : Move to fresh air. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. In case of shortness of breath, give oxygen.

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

Symptoms : Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/consciousness.

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

Treatment : If exposed or concerned: Get medical attention/advice.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : All known extinguishing media can be used.

Extinguishing media which must not be used for safety reasons. : No data available.

5.2. Special hazards arising from the substance or mixture

: Spill will rapidly vaporize forming an oxygen deficient vapor cloud. Vapor cloud may obscure visibility. Do not direct water spray at container vent. Move away from container and cool with water from a protected position. Keep containers and surroundings cool with water spray.

5.3. Advice for firefighters

: Wear self contained breathing apparatus for fire fighting if necessary. Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask. Standard EN 469 - Protective clothing for firefighters. Standard - EN 659: Protective gloves for firefighters.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures	:	Evacuate personnel to safe areas. Ventilate the area. Monitor oxygen level. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
6.2. Environmental precautions	:	Prevent further leakage or spillage. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Do not discharge into any place where its accumulation could be dangerous.
6.3. Methods and material for containment and cleaning up	:	Ventilate the area.
Additional advice	:	If possible, stop flow of product. Increase ventilation to the release area and monitor oxygen level. Vapor cloud may obscure visibility. Do not spray water directly at leak. If leak is from cylinder or cylinder valve, call the emergency telephone number. If the leak is in the user's system, close the cylinder valve and safely vent the pressure before attempting repairs.
6.4. Reference to other sections	:	For more information refer to Sections 8 & 13

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Know and understand the properties and hazards of the product before use. Only experienced and properly instructed persons should handle compressed gases/cryogenic liquids. Before using the product, determine its identity by reading the label. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. 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. Damaged valves should be reported immediately to the supplier. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Do not remove or interchange connections. Ensure the complete gas system has been checked for leaks before use. Prevent entrapment of cryogenic liquid in closed systems not protected with relief device. A small quantity of liquid produces large volumes of vaporized gas at atmospheric pressure. Containers used in shipment, storage, and transfer of cryogenic liquid are specially designed, well-insulated containers equipped with a pressure relief device and valves to control pressure. Under normal conditions, these containers will periodically vent product to limit pressure buildup. Ensure that the container is in a well–ventilated area to avoid creating an oxygen–deficient atmosphere. Use adequate pressure relief in systems and piping to prevent pressure buildup; liquid in a closed container can generate extremely high pressures when vaporized by warming. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Only transfer lines designed for cryogenic liquids shall be used. Do not subject containers to abnormal mechanical shock. When moving cylinders, even for short distances, use a cart

(trolley, hand truck, etc.) designed to transport cylinders. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier.

7.2. Conditions for safe storage, including any incompatibilities

Do not allow storage temperature to exceed 50°C (122°F). Containers should be stored in a purpose build compound which should be well ventilated, preferably in the open air. Full containers should be stored so that oldest stock is used first. Do not store in a confined space. Full and empty cylinders should be segregated. Store containers in location free from fire risk and away from sources of heat and ignition. Return empty containers in a timely manner. Stored containers should be periodically checked for general condition and leakage. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Cryogenic containers are equipped with pressure relief devices to control internal pressure. Under normal conditions these containers will periodically vent product. All vents should be piped to the exterior of the building. Observe all regulations and local requirements regarding storage of containers.

7.3. Specific end use(s)

Refer to section 1 or the extended SDS if applicable.

For further information on storage, handling, and use, consult Air Products' Safetygram 7: Liquid Nitrogen, available on our web site at www.airproducts.com.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

If applicable, refer to the extended section of the SDS for further information on CSA.

8.2. Exposure controls

Engineering measures

Natural or mechanical to prevent oxygen deficient atmospheres below 19.5% oxygen.
Keep self contained breathing apparatus readily available for emergency use.

Personal protective equipment

Respiratory protection	:	Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmosphere. Air purifying respirators will not provide protection. Users of breathing apparatus must be trained.
Hand protection	:	Wear working gloves when handling gas containers. Standard EN 388 - Protective gloves against mechanical risk. If the operation involves possible exposure to a cryogenic liquid, wear loose fitting thermal insulated or cryo-gloves. Standard EN 511 - Cold insulating gloves.
Eye/face Protection	:	Safety glasses recommended when handling cylinders. Protect eyes, face and skin from liquid splashes. Wear goggles and a face shield when transfilling or breaking transfer connections.

Standard EN 166 - Personal eye-protection.

Skin and body protection	:	Never allow any unprotected part of the body to touch uninsulated pipes or vessels which contain cryogenic fluids. The extremely cold metal will cause the flesh to stick fast and tear when one attempts to withdraw from it. Safety shoes are recommended when handling cylinders. Standard EN ISO 20345 - Personal protective equipment - Safety footwear.
Special instructions for protection and hygiene	:	Ensure adequate ventilation, especially in confined areas.
Environmental Exposure Controls	:	If applicable, refer to the extended section of the SDS for further information on CSA.
Remarks	:	Simple asphyxiant.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

(a/b) Physical state/Colour	:	Liquefied gas. Colorless.
(c) Odour	:	No odor warning properties.
(e) Relative Density	:	0.8 (water = 1)
(f) Melting point / freezing point	:	-346 °F (-210 °C)
(g) Boiling point/range	:	-321 °F (-196 °C)
(h) Vapor pressure	:	Not applicable.
(i) Water solubility	:	0.02 g/l
(j) Partition coefficient (n-octanol/water)	:	Not applicable.
(k) pH	:	Not applicable.
(l) Viscosity	:	Not applicable.
(m) Particle characteristics	:	No data available.
(n) Lower and upper explosion / flammability limits	:	No data available.
(o) Flash point	:	Not applicable.
(p) Autoignition temperature	:	No data available.
(q) Decomposition temperature	:	No data available.

9.2. Other information

Explosive properties	:	No data available.
Oxidizing properties	:	No data available.
Molecular Weight	:	28 g/mol
Odor threshold	:	No data available.
Evaporation rate	:	Not applicable.
Flammability (solid, gas)	:	Refer to product classification in Section 2
Upper flammability limit	:	Not applicable.
Lower flammability limit	:	Not applicable.
Relative vapor density	:	0.97 (air = 1)

SECTION 10: Stability and reactivity

10.1. Reactivity	:	Refer to possibility of hazardous reactions and/or incompatible materials sections.
10.2. Chemical stability	:	Stable under normal conditions.
10.3. Possibility of hazardous reactions	:	No data available.
10.4. Conditions to avoid	:	No data available.
10.5. Incompatible materials	:	Carbon steel.
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

Likely routes of exposure

Effects on Eye	:	Contact with liquid may cause cold burns/frostbite.
Effects on Skin	:	Contact with liquid may cause cold burns/frostbite. May cause severe frostbite.

Inhalation Effects	:	In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Asphyxiation may bring about unconsciousness without warning and so rapidly that victim may be unable to protect themselves.
Ingestion Effects	:	Ingestion is not considered a potential route of exposure.
Symptoms	:	Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/consciousness.

Acute toxicity

Acute Oral Toxicity	:	No data is available on the product itself.
Acute Inhalation Toxicity	:	No data is available on the product itself.
Acute Dermal Toxicity	:	No data is available on the product itself.
Skin corrosion/irritation	:	No data available.
Serious eye damage/eye irritation	:	No data available.
Sensitization.	:	No data available.

Chronic toxicity or effects from long term exposures

Carcinogenicity	:	No data available.
Reproductive toxicity	:	No data is available on the product itself.
Germ cell mutagenicity	:	No data is available on the product itself.
Specific target organ systemic toxicity (single exposure)	:	No data available.
Specific target organ systemic toxicity (repeated exposure)	:	No data available.
Aspiration hazard	:	No data available.

SECTION 12: Ecological information

12.1. Toxicity

Aquatic toxicity	:	Not applicable.
Toxicity to other	:	Not applicable.

organisms

12.2. Persistence and degradability

No data available.

12.3. Bioaccumulative potential

Refer to Section 9 "Partition Coefficient (n-octanol/water)".

12.4. Mobility in soil

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

12.5. Results of PBT and vPvB assessment

If applicable, refer to the extended section of the SDS for further information on CSA.

12.6. Other adverse effects

No data available.

Effect on the ozone layer		
Ozone Depleting Potential	:	No data available.
Global Warming Potential	:	No data available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods	:	Return unused product in original cylinder to supplier. Contact supplier if guidance is required. 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: 16 05 05: Gases in pressure containers other than those mentioned in 16 05 04.
Contaminated packaging	:	Return cylinder to supplier.

SECTION 14: Transport information

ADR

UN/ID No.	:	UN1977
Proper shipping name	:	NITROGEN, REFRIGERATED LIQUID
Class or Division	:	2
Tunnel Code	:	(C/E)

Label(s) : 2.2
ADR/RID Hazard ID no. : 22
Marine Pollutant : No

IATA

UN/ID No. : UN1977
Proper shipping name : Nitrogen, refrigerated liquid
Class or Division : 2.2
Label(s) : 2.2
Marine Pollutant : No

IMDG

UN/ID No. : UN1977
Proper shipping name : NITROGEN, REFRIGERATED LIQUID
Class or Division : 2.2
Label(s) : 2.2
Marine Pollutant : No
Segregation Group: : None

RID

UN/ID No. : UN1977
Proper shipping name : NITROGEN, REFRIGERATED LIQUID
Class or Division : 2
Label(s) : 2.2
Marine Pollutant : No

Further Information
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. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact customer service.

SECTION 15: Regulatory information

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

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on Inventory.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.
Japan	ENCS	Included on Inventory.

Other Regulations
REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

COMMISSION REGULATION (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Regulation (EC) No 1272/2008 the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

15.2. Chemical safety assessment

If this product does not contain exposure scenarios, the components in this product are either exempt from REACH, do not meet the minimum volume threshold for a CSA, or the CSA has not yet been completed.

SECTION 16: Other information

Ensure all national/local regulations are observed.

Hazard Statements:
H281 Contains refrigerated gas; may cause cryogenic burns or injury.

Indication of Method:
Gases under pressure Refrigerated liquefied gas Contains refrigerated gas; may cause cryogenic burns or injury.
Calculation method

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
ELINCS - European List of Notified Chemical Substances
CAS# - Chemical Abstract Service number
PPE - Personal Protection Equipment
Kow - octanol-water partition coefficient
DNEL - Derived No Effect Level
LC50 - Lethal Concentration to 50 % of a test population
LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose)
NOEC - No Observed Effect Concentration

PNEC - Predicted No Effect Concentration
RMM - Risk Management Measure
OEL - Occupational Exposure Limit
PBT - Persistent, Bioaccumulative and Toxic
vPvB - Very Persistent and Very Bioaccumulative
STOT - Specific Target Organ Toxicity
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 - International Maritime Dangerous Goods
RID - Regulations concerning the International Carriage of Dangerous Goods by Rail
WGK - Water Hazard Class

Key literature references and sources for data:
ECHA - Guidance on the compilation of safety data sheets
ECHA - Guidance on the application of the CLP Criteria
ARIEL database

Prepared by : Air Products and Chemicals, Inc. Global EH&S Product Safety Department

For additional information, please visit our Product Stewardship web site at
http://www.airproducts.com/productstewardship/

This Safety Data Sheet has been established in accordance with the applicable European Directives and applies to all countries that have translated the Directives in their national laws. COMMISSION REGULATION (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

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