

# Liquid Nitrogen Dewar User Guide



[tell me more](#)



# Contents

## 1. Before you begin

- 1.1. Checking the Dewar and Accessories Prior to Use

## 2. Introduction and safety concerns

- 2.1. Introduction
- 2.2. Contamination
- 2.3. Safety Concerns
- 2.4. Main Properties of Liquid Nitrogen
- 2.5. Safety Training

## 3. Personal Protective Equipment

- 3.1. Introduction
- 3.2. Eye Protection
- 3.3. Hand Protection
- 3.4. Body Protection
- 3.5. Foot Protection

## 4. Liquid Nitrogen Storage and Handling

- 4.1. Introduction
- 4.2. Storage of a Liquid Nitrogen Dewar
- 4.3. Manual handling of a Dewar
- 4.4. General handling
- 4.5. Challenging Conditions
- 4.6. Use of Lifts
- 4.7. Transportation of a Dewar in a vehicle

## 5. Using the Dewar

- 5.1. Introduction
- 5.2. Filling a Dewar with Liquid Nitrogen
- 5.3. Filling Procedure
- 5.4. After Filling
- 5.5. Decanting from the Dewar
- 5.6. Storing a Dewar with a Liquid Withdrawal Device Fitted

## 6. First Aid

- 6.1. First Aid for Asphyxiation
- 6.2. First Aid for Cryogenic/Cold Burns

## 7. Safety Data Sheets

- 7.1. [Link to Nitrogen \(refrigerated\) safety data sheet](#)

# Introduction

## 1. Before you begin

### 1.1. Checking the Dewar and Accessories Prior to Use

On receipt of the Dewar and any accessories, check that you have received all the appropriate parts and that they are all in good condition.

Prior to filling the Dewar with liquid nitrogen:

Remove Dewar from any protective packaging. Failure to do so can result in vacuum deterioration caused by the vacuum seal being chilled by cold gas being trapped by the packaging.

Examine the Dewar for any signs of damage, and check there is no foreign material inside. Check that the insulating material under the protective cap is in place.

Use only the protective cap provided with the Dewar; do not use a tight-fitting plug instead which may be ejected under pressure and result in serious injury.

## 2. Introduction and Safety Concerns

### 2.1. Introduction

This User Guide is designed to help operators use the liquid nitrogen Dewar and associated equipment in a safe and efficient manner. It deals firstly with the safety of operators, the maintenance requirements for the Dewar and other equipment, and the suitability of the areas where the Dewar will be stored and used.

And secondly it covers, First Aid information. Most of the items described within this User Guide can be purchased from Air Products, and we are able to offer an online learning course if you wish to obtain a greater understanding of the hazards associated with handling liquid nitrogen. Our intention is to provide a complete package of instructions to enable the liquid nitrogen Dewar and associated equipment to be used simply and safely in different applications.

It is vital that all users read this information before using the Dewar and any associated equipment as it enables the operators to appreciate the potential hazards associated with the use of these products. Before undertaking any activity, a suitable risk assessment must be conducted for the actual circumstances of use, to identify the safety control measures for example methods to adopt, personal protective equipment (PPE) etc to ensure safety.

Due to its extremely low temperature, liquid nitrogen can cause many materials to become brittle, such that they may break easily, which could result in liquid spillage. Where any equipment is to be used with the Dewar, it is the operator's responsibility to ensure that the equipment is compatible and has been designed to handle cryogenic liquids.

### 2.2. Contamination

All equipment described in this User Guide should be dedicated for purpose where the possibility of cross contamination is present.

# Safety Concerns

## 2.3. Safety Concerns

Liquid nitrogen Dewars and the other associated equipment described in this User Guide have hazards associated with them that need to be understood and managed. By following the guidance in this document, and acting with appropriate caution, the risks of storing and using liquid nitrogen can be reduced to acceptable levels.

## 2.4 Main properties of Liquid Nitrogen

Liquid nitrogen at atmospheric pressure exists at  $-196^{\circ}\text{C}$ , which is the boiling point. This extreme temperature is capable of damaging human tissue. Due to its low temperature, liquid nitrogen will return to its gaseous phase rapidly when it comes into contact with ambient temperatures. In doing so the volume occupied by the resulting gas will be nearly 700 times the volume occupied by the liquid. As this expansion takes place it will displace air and reduce oxygen levels. Even in a vacuum insulated Dewar, the liquid is constantly boiling and emitting gas. If the liquid is kept within a sealed container the pressure within the container will rise to a point where there will be a sudden pressure release.

Therefore, the main hazards associated with the use of liquid nitrogen are cold burns, asphyxiation and pressure release.

Cold burns occur where human contact is made with either the liquid itself or with any article that has been in direct contact with the liquid. The use of Personal Protective Equipment that prevents direct contact, together with safe working practices, provides protection against this.

Asphyxiation occurs where an inert gas i.e. nitrogen, displaces the air sufficiently to deprive the area of the oxygen required to support life. Good ventilation, adequate room size and safe working practices provide protection against this. The use of oxygen depletion monitors with audible and visual and alarms should also be considered.

Pressure release can cause harm due to the release of energy. This may cause physical injury itself or cause other materials and substances to inflict injury. The use of correctly specified equipment, periodic maintenance / examination routines and safe working practices provide protection against dangerous pressure releases.

The previous safety information is provided as an introduction to the hazards of liquid nitrogen. Further information on safety precautions is contained within the following sections.

## 2.5. Safety Training

All users must receive suitable and sufficient information, instruction and training on liquid nitrogen, the use of associated equipment and the task / activity. Air Products can provide further information and guidance, on the safe use of cryogenic liquids and associated equipment. Please contact us to discuss your requirements.

# Protective Equipment

## 3. Personal Protective Equipment

### 3.1 Introduction

Personal protective equipment must be worn by the users of the liquid nitrogen Dewar to protect them from some of the hazards associated with the use of this type of equipment, especially cold burns and pressure release.

All personal protective equipment worn must be manufactured to an appropriate standard, be in good condition, and be regularly inspected for any signs of wear or damage. Defective equipment should be replaced immediately.

Air Products can supply a range of suitable personal protective equipment. Please contact our sales team for details.

A risk assessment must be conducted to identify the personal protective equipment required for each task. The following provides some guidance on which personal protective equipment should be considered as additional protection to other controls.

### 3.2 Eye Protection

Eye protection is essential when working with a liquid nitrogen Dewar, to protect against unexpected liquid splashes or pressure release. Safety goggles are acceptable, but the preferred equipment is a full-face safety visor with neck and brow guards – it is recommended that safety glasses are also worn under the visor.

### 3.3 Hand Protection

Hands must be protected when working with liquid nitrogen to protect against possible cold burns from splashes, or equipment that has been in direct contact with liquid nitrogen. Non-absorbent, insulated safety gloves that closely fit around the wrist are recommended. To prevent splashed liquid entering the glove through the wrist opening, sleeves should cover the wrist ends of the gloves. The gloves must be made from a suitable material, such as leather, and should be a loose fit for easy removal.

### 3.4 Body Protection

All parts of the body should be covered to protect against liquid nitrogen splashes and contact with cold articles i.e. long sleeves, trousers, closed shoes etc. The clothing should be made without pockets or turn-ups where liquid can collect, and trousers should be worn outside boots for the same reason.

It is not recommended to use liquid nitrogen off the ground i.e. on a bench, or steps at chest height, as this significantly increases the risk of splashes to the operator. If unavoidable, operators should consider wearing additional splash protection such as a splash-resistant apron.

### 3.5 Foot Protection

Safety shoes with reinforced toe protection should be worn when working with a liquid nitrogen Dewar. Open footwear such as sandals must not be worn, and neither should any footwear that will allow liquid nitrogen to easily penetrate its surface.

## 4. Liquid Nitrogen Storage and Handling

### 4.1 Introduction

The areas where liquid nitrogen is stored and used is of key importance, as is the manual handling of the liquid nitrogen containers.

This section deals with those issues by outlining the key concerns and providing safe strategies for dealing with them, in both general and more challenging situations.

### 4.2 Storage of a Liquid nitrogen Dewar

It is important to consider where your Dewar is stored and used. Ensuring the suitability of the area manages some of the hazards of this product and reduces the associated risks. Wherever possible, Dewars should be stored externally in an open, well-ventilated position that is at, or above, ground level and sheltered from rain. Always store the Dewar with the protective cap, cover or liquid withdrawal device in place to prevent any moisture or foreign material entering the container. Where the Dewar is fitted with a liquid withdrawal device, periodically check for any excessive icing during storage.

The Dewar should be stored on firm level ground made of concrete or other suitable non-porous materials, and in a secure designated area where access can be restricted to only personnel that have received the appropriate training. Your Dewar should be stored away from other chemicals, substances or atmospheres that could cause corrosion and liquid must not be allowed come in to contact with other substances.

Liquid nitrogen containers constantly release nitrogen gas into the surrounding atmosphere. If the Dewar is being stored or used outdoors this should not normally present any risk. If, however, they are being stored or used inside a building, this may eventually reduce the oxygen level in the air, which could cause asphyxiation.

If the Dewar will be stored or used inside a building, a risk assessment must be conducted to identify the risk and the level of ventilation required. The British Compressed Gases Association (BCGA) have produced a guidance note to help conduct the risk assessment and identifying appropriate control measures - GN 11 The Management of risk when using gases in enclosed workplaces.

An empty Dewar should be stored in a dry area, if possible, allow the Dewar to warm to ambient temperature prior to storage. Always store the Dewar with the protective cap or liquid withdrawal device in place to prevent any moisture or foreign material entering the container. Always check that a Dewar is completely empty before being put into long-term storage.

When disposing of liquid nitrogen, the Dewar must always be emptied slowly in a safe and well-ventilated outdoor area where there is no risk of persons being asphyxiated by the gases released. A Dewar must never be emptied in confined spaces, or near to air intakes, to buildings, water courses, drains or other below ground openings.

# Storage and Handling

The Dewar should preferably be emptied onto earth or concrete and must not be emptied onto any materials that could become embrittled by the extremely low temperature of the liquid.

## 4.3 Manual Handling of a Dewar

Particular attention to safety must be shown when manually handling a Dewar. The safety of the person(s) carrying out the handling, and other surrounding personnel, must be considered. This section outlines the main points.

## 4.4 General Handling

The normal manual handling hazards exist with Dewars due to their possible weight and bulk. Users should ensure they follow the standard manual handling precautions to avoid any strains or injuries.

A Dewar should be handled with care at all times to avoid any liquid spillage. Where possible avoid carrying a Dewar, instead use specifically design trolleys. Spillages could result in cold burns to the skin and/or oxygen depletion of the atmosphere.

Always handle an empty Dewar as if it is full; it may be that it still contains some residual liquid nitrogen. Do not 'walk', roll or drag a Dewar, and take care to protect them from any severe jolting or impact, as rough handling may also result in serious damage to your Dewar. Keep the Dewar upright at all times, except when decanting liquid nitrogen. When transporting the Dewar, ensure that the protective cap or liquid withdrawal device is properly fitted.

Wherever possible, use a special trolley to lift and move your Dewar. Air Products can provide a trolley that is specifically designed for this, please contact us for further information.

## 4.5 Challenging Conditions

Avoid handling a Dewar in challenging conditions such as:

- Through a doorway or other restricted access way.
- In areas where there is poor lighting.
- In areas with uneven ground where there is additional risk of slips, trips or falls.
- Up or down steps or stairs.

Where avoidance is not possible:

- It is recommended that two people are involved
- Exclude others from the immediate area
- Consider wearing additional body protection against spillage
- Consider the installation of a stair lift where feasible

## 4.6 Use of Lifts

All parts of the body should be covered to protect against liquid nitrogen splashes and contact with cold articles i.e. long sleeves, trousers, closed shoes etc. The clothing should be made without pockets or turn-ups where liquid can collect, and trousers should be worn outside boots for the same reason.

# Storage and Handling

Due to the small internal volume of lifts, the transportation of a filled Dewar in an occupied lift is hazardous and should be avoided wherever possible. The main hazards being asphyxiation and possible damage to the lift.

An asphyxiating atmosphere may be caused by the operation of the safety relief valves on the liquid withdrawal device (where fitted), liquid splashes, or boiling liquid vaporising into the lift. The effects of an oxygen-deficient atmosphere in a lift with a small internal volume could overcome any persons in the lift quite quickly.

Damage can be inflicted on the lift structure from any liquid nitrogen that is spilled inside it. This can cause embrittlement and subsequent failure of certain materials, and it is therefore recommended that the lift floor be checked for mechanical damage after any spillage.

Where the use of a lift to transport a filled Dewar is unavoidable, is strongly recommended that the Dewar travels unaccompanied, and personnel access to the lift is prevented until the Dewar has been removed at its destination.

Before transporting a filled Dewar in an occupied lift, a full risk assessment must be conducted to ensure the operation can be carried out safely.

The total quantity of liquid in the lift must be kept to a minimum.

## 4.7 Transportation of a Dewar in a vehicle

The transportation of liquid nitrogen in vehicles is extremely hazardous and should be avoided wherever possible. Where the use of a vehicle to transport the Dewar is unavoidable, the user must comply with The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 and should consult with a qualified dangerous goods safety advisor. In addition, the following good working practices must be adhered to:

- Dewars must be transported separately from the driver or passengers.
- Flat-back vehicles, trailers or other vehicles with a separating bulkhead that gas cannot leak through should be used wherever possible.
- Cars should not be used.
- Drivers must be properly trained in the properties and hazards of liquid nitrogen, the safe handling of the containers and the actions to take in the event of an incident.
- The Dewar must be checked to ensure they are adequately labelled before transportation (i.e. the labelling must include the product designation, product UN number, product danger sign and hazard and precautionary statements).
- The Dewar must be properly secured before transportation.
- The Dewar must be checked for any signs of damage before transportation.
- The Dewar must always be fitted with protective caps, only caps designed for use with the containers shall be used.
- Do not transport a damaged Dewar or a Dewar that has condensation or frosting on the outside surface.
- A Dewar must be filled to the correct level and never over filled.



# Using the Dewar

## 5. Using the Dewar

### 5.1 Introduction

The Dewar supplied by Air Products is designed for the storage of liquid nitrogen; it is not intended to be used for storing any other type of liquid or material.

### 5.2 Filling a Dewar with Liquid Nitrogen

For filling instructions consult with the manufacturer's instructions that were supplied with the Dewar.

Air Products can provide a liquid nitrogen delivery service to fill a Dewar at your premises. This reduces the involvement for you and is carried out by our fully trained Customer Service Operators. Please note that we are unable to fill directly into a Dewar or freezer that contains samples.

### 5.3 Filling Procedure

Please consult the Dewar manufacturer's instructions.

### 5.4 After Filling

When transporting the Dewar, adhere to the guidance given in Section 4.

Do not leave a Dewar containing liquid nitrogen unattended unless it is in a designated storage area.

### 5.5 Decanting Liquid Nitrogen from the Dewar

Consult the Dewar manufacturer's instructions.

Note: Air Products preferred method of decanting liquid from a Dewar, is to fit a low-pressure liquid withdrawal device to the Dewar. This is preferred over manual pouring as it eliminates manual handling concerns and allows more control over the decanting operation. Air Products can supply low-pressure liquid withdrawal devices, please contact the sales team for more information.

### 5.6 Storing a Dewar with the Liquid Withdrawal Device Fitted

When storing a Dewar for short periods it is more practical to leave the liquid withdrawal device fitted, so that the pressure required for dispensing is kept inside the vessel. This will prevent having to wait for the pressure to build up in the Dewar after refitting the device before liquid can be dispensed. When storing a Dewar for long periods however, it is more efficient to remove the liquid withdrawal device to keep the evaporation rate at a minimum. As a rule of thumb, the evaporation rate with withdrawal device fitted will approximately double.

When a Dewar is stored with the liquid withdrawal device fitted, the pressure in the Dewar will be maintained automatically at a safe level by means of a relief valve device. These may release pressure continuously or periodically. Never prevent gas escaping from a pressure relief device.

## 6. First Aid

### 6.1 First Aid for Asphyxiation

If a person seems to become disorientated, confused or loses consciousness while working with liquid nitrogen, **ONLY IF SAFE TO DO SO**, remove the victim to a well-ventilated area immediately. Remember nitrogen gas is an asphyxiant and is invisible - Don't become the second victim by rushing in to help – call the emergency services if unsure of safety.

Keep the victim warm and rested, summon medical aid, and apply artificial respiration if breathing has stopped.

### 6.2 First Aid for Cryogenic/Cold Burns

Liquid nitrogen in contact with human tissue can produce similar effect to a burn. The severity is dependent on temperature and the time of exposure.

Immediate medical treatment is required. If the area is large, send for an ambulance. Continue with the treatment below while waiting.

- Flush the affected areas with copious quantities of tepid water, do not apply any form of direct or dry heat, for example, hot water, fan heater.
- Move the casualty to a warm place, Keep the patient warm and rested.
- Loosen any restrictive clothing, but do not remove adherent clothing until thawed thoroughly.
- Protect frozen parts with bulky, dry, sterile dressings. Do not apply too tightly to avoid restriction of blood circulation.
- Ensure that the first aider, ambulance crew or the hospital is advised of details of the accident and first aid treatment already administered.
- Smoking and alcoholic beverages reduce the blood supply to the affected part and should be avoided.

Treatment for shock may be necessary.

If there has been massive exposure to the super-cold material so that the general body temperature is depressed (which is a highly unlikely possibility), the patient should be re-warmed by total immersion into a warm bath. Shock may occur during re-warming.

Frozen tissues are painless and appear waxy with a pallid yellowish colour. They become painful, swollen and prone to infection once thawed. Thawing may take from 15 to 20 minutes and should be continued until the colour of the skin turns from pallor to blue, and then to pink then red.

When the frozen part of the body has thawed, cover the area with dry sterile dressings with a large protective covering.

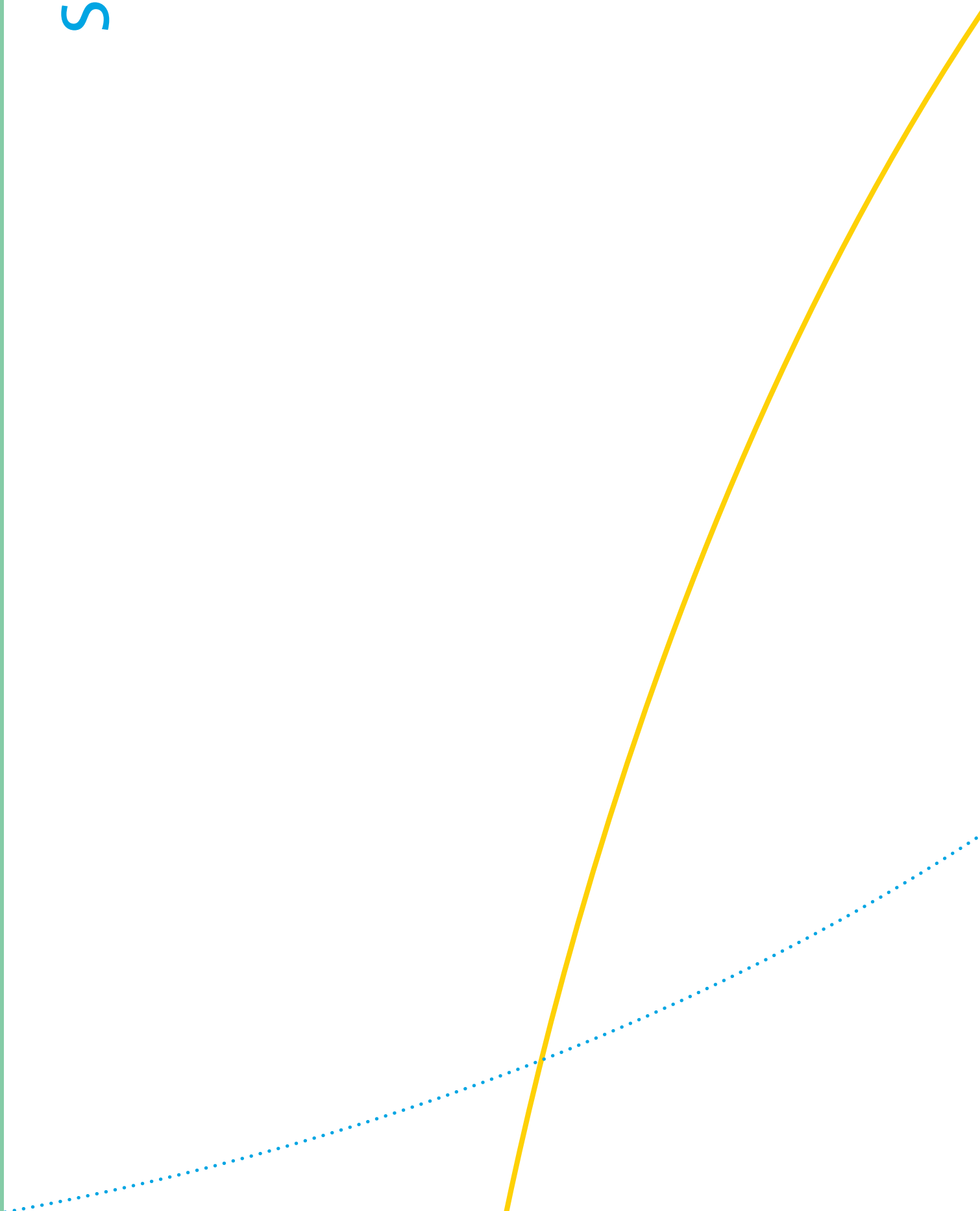
Medical help will be needed to combat pain, and to prevent infection.

# Safety

## 7. Safety Data Sheet

### 7.1 Nitrogen (refrigerated) safety data sheet:

<https://sds.airproducts.com/DisplayPDF?documentID=175060>



**For more information,  
please contact us at:**

Air Products PLC  
2 Millennium Gate  
Crewe  
CW1 6AP  
T 0800 389 0202



**tell me more**  
[airproducts.co.uk](http://airproducts.co.uk)