

SAFETY DATA SHEET
Refrigerant Gas R422D

Version 1
Revision Date: 13.02.2013



SAFETY DATA SHEET
REFRIGERANT R422D

SECTION 1: IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

1.1. Product Identifier

Product name: REFRIGERANT R422D

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

Use: Refrigerant.
Advised Against: No specific uses advised again have been identified, other than restrictions in the F-Gas Regulations.

1.3. Details of the supplier of the safety data sheet

Company name: National Refrigerants Ltd.
4 Watling Close
Sketchley Meadows Business Park
Hinckley LE10 3EZ
Tel: +44(0)1455 630790
Fax: +44(0) 1455 630791
Email: sds@nationalref.com

1.4. Emergency telephone number

Emergency Tel: +44(0) 1865 407333

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance of mixture

Classification under CHIP: This substance is not classified as dangerous according to Directive 67/548/EEC.
Most important adverse effect: Rapid evaporation of the liquid may cause frostbite.
Vapour is heavier than air and can cause suffocation.

2.2. Label elements

Directives 67/458/EEC or 1999/45/EC: This substance is not classified as dangerous according to Directive 67/548/EEC.
Special labelling of certain mixtures: Contains fluorinated greenhouse gases covered by the Kyoto Protocol

2.3. Other hazards

Vapours are heavier than air and can cause suffocation by reducing oxygen for breathing.
Rapid evaporation of the liquid may cause frostbite.
Misuse or intentional abuse may cause death without warning symptoms, due to cardiac effects.
May cause cardiac arrhythmia.

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

3.2 Mixtures

1,1,1,2-TETRAFLUOROETHANE (R134A)

EINECS	CAS	67/548/EEC Classification	CLP Classification	Percent
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212-377-0	811-97-2		H280: Pressurised gas	30.5 – 32.5%
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PENTAFLUOROETHANE (R125)

EINECS	CAS	67/548/EEC Classification	CLP Classification	Percent
206-557-8	354-33-6		H280: Pressurised gas	64 -66%

ISOBUTANE (R600a)

EINECS	CAS	67/548/EEC Classification	CLP Classification	Percent
200-857-2	75-28-5	F+; R12	H220: Flammable gas H280: Pressurised Gas H336: May cause drowsiness or dizziness.	3.0 – 3.5%

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

- General advice:** If unconscious place in recovery position and seek medical advice. Never give anything by mouth to an unconscious person. If breathing is irregular or stopped administer artificial respiration.
 First aider needs to protect himself.
 If symptoms persist, call a physician.
- Skin contact:** Take off all contaminated clothing immediately if not stuck to the skin. Flush area with lukewarm water. Do not use hot water. If frostbite has occurred call a physician.
- Eye contact:** Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention.
- Ingestion:** This is not considered a potential route of exposure.
- Inhalation:** Remove from exposure, lie down. Move to fresh air. Keep patient warm and at rest. Artificial respiration and/or oxygen may be necessary. Consult a physician.

4. 2. Most important symptoms and effects, both acute and delayed

- Symptoms** Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects. Other symptoms potentially related to misuse or inhalation abuse are: anaesthetic effects, Light-headedness, dizziness, confusion, incoordination, drowsiness or unconsciousness, irregular heartbeat with strange sensation in the chest, heart thumping, apprehension, feeling of fainting, dizziness or weakness, drowsiness, narcosis.
- Skin contact:** Low exposure will cause redness and pain. High exposure will cause frostbite, blisters and severe pain.
- Eye contact:** Cause severe pain and cornea damage.
- Ingestion:** Not a route of exposure.
- Inhalation:** Shortness of breath, severe headache, dizziness, nausea, weakness, and unconsciousness. Irregular cardiac activity.
- Treatment:** Do not give adrenaline or similar drugs.

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

- Immediate/special treatment:** Burns pack should be available on the premises.

SECTION 5: FIRE-FIGHTING MEASURES

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5.1. Extinguishing media

Extinguishing media: Use extinguishing measures that are appropriate to local and surrounding environment. Cool cylinders/tanks with water spray.
Use water spray, Alcohol-resistant foam, Dry chemical or Carbon dioxide (CO₂).

5.2. Special hazards arising from the substance or mixture

Special hazards arising from the mixture Pressure build-up. Fire or intense heat may cause violent rupture of packages.
Hazardous thermal decomposition products: carbon oxides, hydrogen fluoride, carbonyl fluoride.
Exposure to decomposition products may be a hazard to health.

5.3. Advice for fire-fighters

Advice for fire-fighters: In the event of fire wear self-contained breathing apparatus.
Use personal protective equipment.
Wear neoprene gloves during cleaning work after a fire.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions: Evacuate personnel to safe areas. Ventilate the area, especially low or enclosed places where heavy vapours might collect.
Refer to protective measures listed in sections 7 and 8.

6.2. Environmental precautions

Environmental precautions: Should not be released into the atmosphere.

6.3. Methods and material for containment and cleaning up

Clean-up procedures: Material evaporates.

6.4. Reference to other sections

Reference to other sections: Refer to Section 7 of SDS. Refer to Section 8 of SDS.
For disposal instructions see section 13.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Handling requirements: *Advice on handling:* Avoid breathing vapours or mist. Avoid liquid contact with skin and clothing. Provide sufficient air exchange and/or exhaust in work rooms.
Advice on protection against fire and explosion: The product is not flammable in air under ambient conditions of temperature and pressure. When pressurised with air, or oxygen, the mixture may become flammable or reactive under certain conditions.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions: Do not drag, slide or roll cylinders. Never attempt to lift cylinder by its cap. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Keep at temperature not exceeding 52°C. Keep cylinders tightly closed in a dry, cool and well-ventilated place. Protect from contamination. Protect cylinders from damage. Keep away from direct sunlight. Store only in approved containers.

Suitable packaging: Store in original cylinder only.
Protect from contamination.

Storage temperature: Less than 52°C

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7.3. Specific end use(s)

Specific end use(s) No data available.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

If subsection is empty then no values are applicable

8.1. Control parameters

Hazardous ingredients:

If subsection is empty then no values are applicable.

1,1,1,2-TETRAFLUOROETHANE (HFC134a)

Workplace exposure limits

Type/Form of exposure	Control parameters	Update	Basis	Remarks
TWA	4240 mg/m ³ 1000 ppm	2007	EH40 WEL	

8.2. Derived No Effect Level (DNEL)

1,1,1,2-Tetrafluoroethane

Type of Application (Use): Workers
 Exposure routes: Inhalation.
 Health Effect: Chronic effects, Systemic toxicity
 Value: 13936 mg/m³

Type of Application (Use): Consumers
 Exposure routes: Inhalation.
 Health Effect: Chronic effects, Systemic toxicity
 Value: 2476 mg/m³

Pentafluoroethane

Type of Application (Use): Workers
 Exposure routes: Inhalation.
 Health Effect: Chronic effects, Systemic toxicity
 Value: 16444 mg/m³

Type of Application (Use): Consumers
 Exposure routes: Inhalation.
 Health Effect: Chronic effects, Systemic toxicity
 Value: 1753 mg/m³

8.3 Predicted No Effect Concentration (PNEC)

1,1,1,2-Tetrafluoroethane

Value: 0.1 mg/l
 Compartment: Fresh water

Value: 0.01 mg/l
 Compartment: Marine water

Value: 1 mg/l
 Compartment: Water
 Remarks: Intermittent use/release

Value: 73 mg/l
 Compartment: water
 Remarks: Sewage treatment plants.

Pentafluoroethane

Value: 0.1 mg/l
 Compartment: Fresh water

Value: 1 mg/l

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Compartment: Water
Remarks: Intermittent use/release

Value: 0.6 mg/kg
Compartment: Fresh water sediment

8.4 Exposure controls

- Engineering measures:** Ensure adequate ventilation, especially in confined areas. Local exhaust should be used when large amounts are released.
- Respiratory protection:** For rescue and maintenance work in storage tanks use self-contained breathing apparatus. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Respiratory protection with EN 137.
- Hand protection:**
Material: Leather gloves
The suitability for a specific workplace should be discussed with the producers of protective gloves.

Material: Low temperature resistant gloves.

Protective gloves complying with EN 374 or US OSHA guidelines.

The choice of appropriate gloves does not only depend on its material but also on other quality features and is different from one producer to the other. Please observe the instructions regarding permeability and breakthrough time which are provided by the suppliers of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and contact time.
- Eye protection:** Wear safety glasses or coverall chemical splash goggles
Eye protection complying with EN 166 or ANSI Z87.1
Additionally wear a face shield where the possibility exists for face contact due to splashing, spraying or airborne contact with this material.
- Skin protection:** Wear impervious clothing that covers legs and arms.
- Protective measures** Self-contained breathing apparatus (SCBA) is required if large release occurs.
The type of protective equipment must be selected according to the concentration and amount of the substance at the specific workplace.
When using do not smoke.
- Hygiene measures** Handle in accordance with good industrial hygiene and safety practice.
- Environmental:** Gas escapes to be kept to the minimum by engineering processes and operating methods.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

State:	Liquefied gas under pressure.
Colour:	Clear colourless liquid and vapour.
Odour:	Ethereal
pH:	7 neutral
Melting point/range	No available for this mixture.
Boiling Point/range:	- 46.2 – 41.5°C (boiling range at 1 Bar)
Flash Point:	Does not flash. Non-flammable
Upper explosive limit/upper flammability limit	Method: ASTM E681, None
Vapour pressure:	12.200 Bar (12200 hPa) at 25°C
Liquid Density:	1157 kg/m ³ at 25°C
Water solubility:	Slightly soluble

SECTION 10. STABILITY AND REACTIVITY

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10.1. Reactivity

Reactivity: Decomposes on heating.

10.2. Chemical stability

Chemical stability: Stable under normal conditions.

10.3. Possibility of hazardous reactions

Hazardous reactions: Polymerization will not occur. Hazardous reactions will not occur under recommended storage and transport conditions.

10.4. Conditions to avoid

Conditions to avoid: Heat, hot surfaces, flames.
The product is not flammable in air under ambient conditions of temperature and pressure. When pressurised with air or oxygen, the mixture may become flammable. Certain mixtures of HCFCs of HFCs with chlorine may become flammable or reactive under certain conditions. Avoid open flames and high temperatures. Pressurised container: do not pierce or burn, even after use.
Keep at temperature not exceeding 52°C.

10.5. Incompatible material

Materials to avoid: Alkali metals, alkaline earth metals, powdered metals, powdered metal salts.

10.6. Hazardous decomposition products

Hazardous decomposition products Thermal decomposition yields toxic products which can be corrosive in the presence of moisture. Decomposition products may include: Hydrogen Fluoride, carbon oxides, Fluorocarbons, Carbonyl Fluoride.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Acute oral toxicity

Pentafluoroethane Not applicable
Isobutane (<0.1% butadiene) Not applicable

Acute inhalation toxicity

Inhalation

Difluoromethane: LC₅₀/4 h rat: 276808 ppm
The toxicological data has been taken from products of similar composition.
LC₅₀/ 4 h rat: > 31 mg/l
Low Observed Adverse Effect Concentration (LOAEC)/ dog: 70000ppm

Pentafluoroethane: LC₅₀/rat: > 800 000 ppm
Low Observed Adverse Effect Concentration (LOAEC)/ dog: 100000ppm
Cardiac sensitisation.

1,1,1,2-Tetrafluoroethane: LC₅₀/4 hr rat: 567000 ppm
Low Observed Effect Concentration (LOAEC)/ dog: 75000 ppm
Cardiac sensitisation.
No Observed Adverse Effect Concentration (NOAEC)/ dog: 50000 ppm

Acute dermal toxicity

Isobutane: Not applicable
Pentafluoroethane: Not applicable

Skin Irritation

Isobutane: Not tested on animals.
Classification: Not classified as irritant.

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Result: No skin irritation.
Not expected to cause skin irritation based on expert review of the properties of the substance.

Pentafluoroethane:

Not tested on animals.
Classification: Not classified as irritant
Result: No skin irritation.
Not expected to cause skin irritation bases on expert review of the properties of the substance.

1,1,1,2-Tetrafluoroethane:

Rabbit
Classification: Not classified as irritant
Result: slight skin irritation.
Not expected to cause skin irritation bases on expert review of the properties of the substance.

Human
Classification: Not classified as irritant
Result: No skin irritation.

Eye irritation

Isobutane:

Not tested on animals.
Classification: Not classified as irritant
Result: No eye irritation.
Not expected to cause eye irritation bases on expert review of the properties of the substance.

Pentafluoroethane:

Not tested on animals.
Classification: Not classified as irritant
Result: No eye irritation.
Not expected to cause eye irritation bases on expert review of the properties of the substance.

1,1,1,2-tetrafluoroethane

Rabbit
Classification: Not classified as irritant
Result: slight irritation.
Not expected to cause eye irritation bases on expert review of the properties of the substance.

Human
Classification: Not classified as irritant
Result: No eye irritation.

Sensitisation

Isobutane:

Not tested on animals.
Classification: Not a skin sensitisation
Result: Does not cause skin sensitisation.
Not expected to cause skin sensitisation bases on expert review of the properties of the substance.

Pentafluoroethane:

Not tested on animals.
Classification: Not a skin irritant
Result: Does not cause skin sensitisation.
Not expected to cause skin sensitisation bases on expert review of the properties of the substance.
There are no reports of human respiratory sensitization.

1,1,1,2-Tetrafluoroethane:

Guinea pig
Classification: Not a skin irritant
Result: Did not cause skin sensitisation on laboratory animals.
Not expected to cause skin sensitisation bases on expert review of the properties of the substance.

Did not cause sensitisation on laboratory animals. There are no reports of human respiratory sensitisation.

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Repeated Dose Toxicity

1,1,1,2-Tetrafluoroethane:

Inhalation rat
No toxicologically significant effects were found.

Pentafluoroethane:

Inhalation rat
No toxicologically significant effects were found.

Isobutane (<0.1% butadiene):

Inhalation rat
No toxicologically significant effects were found.

Mutagenic assessment

Isobutane:

Animal testing did not show any mutagenic effects.
Tests on bacteria or mammalian cell cultures did not show mutagenic effects.

Pentafluoroethane:

Animal testing did not show any mutagenic effects.
Tests on bacteria or mammalian cell cultures did not show mutagenic effects.

1,1,1,2-Tetrafluoroethane:

Animal testing did not show any mutagenic effects.
Tests on bacteria or mammalian cell cultures did not show mutagenic effects.

Carcinogenicity Assessment

Isobutane:

No data available

Pentafluoroethane:

Not classifiable as a human carcinogen.

1,1,1,2-Tetrafluoroethane:

Not classifiable as a human carcinogen.

Toxicity to reproduction assessment

Isobutane (<0.1% Butadiene):

No toxicity to reproduction.

Pentafluoroethane:

No toxicity to reproduction.

1,1,1,2-Tetrafluoroethane:

No toxicity to reproduction.

Assessment Teratogenicity

Pentafluoroethane:

Did not show teratogenic effects in animal experiments.

Isobutane (<0.1% Butadiene):

No toxicity to reproduction.

Further information

Rapid evaporation of the liquid may cause frostbite. May cause cardiac arrhythmia.

SECTION 12. ECOLOGICAL INFORMATION

12.1. Toxicity

Toxicity to fish:

Isobutane:

LC₅₀/96 h/Fish: 24.11 mg/l

Pentafluoroethane:

LC₅₀/96 h/Oncorhynchus (rainbow trout): > 81.2 mg/l
Information given is based on data obtained from similar substances.

LC₅₀/96 h/Danio rerio (zebra fish): > 200 mg/l
Information given is based on data obtained from similar substances.

LC₅₀/96 h/Oncorhynchus mykiss (rainbow trout): 450 mg/l
Information given is based on data obtained from similar substances.

1,1,1,2-Tetrafluoroethane

LC₅₀/96 h/Oncorhynchus mykiss (rainbow trout): 450 mg/l

Toxicity to Aquatic plants:

Diffuoromethane:

LC₅₀/96 h/Algae: 142 mg/l

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Pentafluoroethane:	LC ₅₀ /72 h/Pseudokirchneriella subcapitata (green algae): >118 mg/l Information given is based on data obtained from similar substances. LC ₅₀ /72 h/Pseudokirchneriella subcapitata (green algae): >114 mg/l Information given is based on data obtained from similar substances. LC ₅₀ /96 h/Algae: 142 mg/l Information given is based on data obtained from similar substances.
1,1,1,2-Tetrafluoroethane:	LC ₅₀ /72 h/algae: >118 mg/l Information given is based on data obtained from similar substances.
Isobutane:	EC ₅₀ /72 h/Algae: 7.71 mg/l
Toxicity to aquatic invertebrates	
Isobutane:	EC ₅₀ /48 h/Daphnia: 14.22 mg/l
Pentafluoroethane	EC ₅₀ /48 h/Daphnia magna (Water flea): > 200 mg/l Information given is based on data obtained from similar substances. EC ₅₀ /48 h/Daphnia magna (Water flea): > 97.9 mg/l Information given is based on data obtained from similar substances. EC ₅₀ /48 h/Daphnia magna (Water flea): > 97.9 mg/l Information given is based on data obtained from similar substances.
1,1,1,2-Tetrafluoroethane:	EC ₅₀ /48 h/Daphnia magna (Water flea): 980 mg/l
Ecotoxic values:	When discharged may contribute to the greenhouse effect.
Global Warming Potential (GWP)	2700 (CO ₂ = 1)
Ozone Depletion Potential (ODP)	0 (R11 = 1)

12.2. Persistence and degradability

1,1,1,2-Tetrafluoroethane:	/28 d Not readily biodegradable.
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12.3. Bio accumulative potential

1,1,1,2-tetrafluoroethane:	Bioaccumulation is unlikely.
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12.4. Mobility in soil

Mobility:	No data available.
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12.5. Results of PBT and vPvB assessment

PBT identification:	No data available
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12.6. Other adverse effects

Other adverse effects:

SECTION 13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Product:	Can be used after re-conditioning. If re-conditioning is not practicable dispose of in compliance with local regulations.
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Disposal of packaging: Empty cylinders should be returned to suppliers.
N.B. The user's attention is drawn to the possible existence of regional or national regulations regarding disposal.

SECTION 14. TRANSPORT INFORMATION

14.1. ADR

UN Number: 3163
Class: 2
Classification code: 2A
Hazard Identification Number: 20
Labelling Number: 2.2
Proper Shipping Name: Liquefied Gas N.O.S. (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)
Tunnel code: (C/E)

14.2. IATA_C

UN Number: 3163
Class: 2
Labelling Number: 2.2
Proper Shipping Name: Liquefied Gas N.O.S. (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)

14.3. IMDG

UN Number: 3163
Class: 2
Labelling Number: 2.2
EmS: F-C, S-V
Proper Shipping Name: Liquefied Gas N.O.S. (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)
Marine Pollutant: No

SECTION 15. REGULATORY INFORMATION

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

Special labelling of certain mixtures: Contains fluorinated greenhouse gases covered by the Kyoto Protocol.

15.2. Chemical Safety Assessment

Chemical safety assessment: A chemical safety assessment has not been carried out by the supplier of this mixture.

16. OTHER INFORMATION

Other information: This safety sheet is prepared in accordance with Commission Regulation (EU) No. 453/2010.

Text of R-phrases mentioned in Section 3: R12 Extremely flammable

Full text of H-statements referred under Section 3:
H220 Extremely flammable gas
H280 Contains gas under pressure; may explode if heated.
H336 May cause drowsiness or dizziness

Legal disclaimer: National Refrigerants Ltd. believes that the information and recommendations contained herein (including data and statements) are accurate as of the date hereof. NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE CONCERNING THE INFORMATION PROVIDED HEREIN. The information provided herein relates only to the specific product designated and may not be valid where such product is used in combination with any other methods of use of the product and of the information referred to herein are beyond the control of National Refrigerants Ltd. National Refrigerants Ltd. expressly disclaims any and all liability as to any results obtained or arising from any use of the product or reliance on such information.

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GENERAL SAFETY & HANDLING DATA

1. GENERAL

Only trained persons should handle compressed gases. Observe all regulations and local requirements regarding the storage of Cylinders. Do not remove or deface labels provided by the supplier for the identification of the Cylinder contents. Ascertain the identity of the gas before using it. Know and understand the properties and hazards associated with each gas before using it. When doubt exists as to the correct handling procedure for a particular gas contact the supplier.

HANDLING AND USE

Wear stout gloves. Never lift a Cylinder by the cap or guard unless the supplier states it is designed for that purpose. Use trolley or other suitable device or technique for transporting heavy Cylinders, even for a short distance. Where necessary wear suitable eye and face protection. The choice between safety glasses, chemical goggles, or full face shield will depend on the pressure and nature of the gas being used,

Where necessary for toxic gases see that self-contained positive pressure breathing apparatus or full face airline respirator is available in the vicinity of the working area. Employ suitable pressure regulating device on all Cylinders when gas is being emitted to systems with lower pressure rating than that of the Cylinder. Ascertain that all electrical systems in the area are suitable for service with each gas.

Never use direct flame or electrical heating devices to raise the pressure of a Cylinder, Cylinders should not be subjected to temperatures above 45°C. Never re-compress a gas mixture without consulting the supplier. Never attempt to transfer gases from one Cylinder to another. Do not use Cylinders as rollers or supports, or for any other purpose other than to contain the gas as supplied. Never permit oil, grease or other readily combustible substances to come into contact with valves of Cylinders containing oxygen or other oxidants. Keep Cylinder valves clean and free from contaminants particularly oil and water.

Do not subject Cylinders to mechanical shocks which may cause damage to their valves or safety devices.

Never attempt to repair or modify Cylinder valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close the Cylinder valve whenever gas is not required even if the Cylinder is still connected to the equipment.

2. STORAGE

Cylinders should be stored in a well-ventilated area. Some gases will require a purpose built area. Store Cylinders in a location free from fire risk and away from sources of heat and ignition. Designate as a no smoking area.

Gas Cylinders should be segregated in the storage according to the various categories.

The storage area should be kept clear and access should be restricted to authorized persons only, the area should be clearly marked as a storage area and appropriate hazard warning signs displayed (Flammable, Toxic etc.).

The amount of flammable or toxic gases should be kept to a minimum. Flammable gases should be stored away from other combustible materials.

Cylinders held in storage should be periodically checked for general condition and leakage.

Cylinders in storage should be properly secured to prevent toppling or rolling. Vertical storage is recommended where the Cylinder is designed for this. Cylinder valves should be tightly closed and, where appropriate, valves should be capped or plugged. Protect Cylinders stored in the open against rusting and extremes of weather. Cylinders should not be stored in conditions likely to encourage corrosion. Store full and empty Cylinders separately and arrange full Cylinders so that the oldest stock is used first.

FOR FURTHER INFORMATION CONTACT YOUR NEAREST DISTRIBUTION CENTRE