**Material SAFETY DATA SHEET**

Product name: Refrigerants R-290 (propane) R600a (i-butane), R600 (n-butane) or mixtures of these substances

IMO-2, code UN 1965

(liquefied petroleum gas. LPG-not otherwise specified NOS)

PURPOSE

This material safety data sheet provides you with chemical, physical, toxicological, ecological and safety product data in the interest of safety for both people and the environment as far as this product is concerned. It also contains recommendations for safe storage, handling and application of this product (these products).

The precautionary measures mentioned concerning health and safety as well as the environmental recommendation and advice do not necessarily apply to all people and/or all circumstances. You are obliged as a purchaser or user of this product to assess these measures and recommendations, to handle this product - or have others handle it - safely and to comply with all the applicable laws and regulations. None of the data given may be construed as express or implied permission, recommendation or authorization to use any patented invention without a valid permit. Ecozone BV is not liable for any damage or injury resulting from irregular use, etc. of the product, non-compliance with the recommendations or any risk associated with the nature of the product

NOTE

The data and information given concerning safety, health and the environment are considered to be accurate as of the date given below. We have evaluated all the data given which we have received from sources outside Ecozone BV. The data may not be perceived as being explicit or implicit guarantees of the accuracy or completeness thereof . Nor are the data intended as technical product information, which can be obtained from Ecozone BV upon request.

1. SUBSTANCE AND COMPANY IDENTIFICATION

Product: Refrigerants R-290, R-600a. R600a or mixtures of these substances.
Application As a refrigerant in mechanical cooling systems,
for specific applications contact Ecozone BV for advice.
Company Ecozone BV, phone (including for emergencies) ++31(0)23-5259557.
NVIC (for doctor in attendance) telephone: ++31 (0)30-2748888.
Poison advice centre (Antigif-centrum) in Belgium telephone: ++32 (0)2-264-9636.

2. COMPONENT COMPOSITION AND INFORMATION

Chemical composition Mixture of hydrocarbons consisting of propane (GAS number 74—98-6), N-butane (GAS number 106-97-8) or I-butane (GAS number 75-28-5) or mixutes of the two

3. RISKS

Extremely flammable gas condensed to liquid. Vapours are heavier than air and will disperse over the ground. High concentrations of vapour may result in unconsciousness and asphyxiation.

4. FIRST-AID MEASURES

If inhaled: Remove the victim from the exposure area and into the fresh air. Keep the victim calm and check breathing.
Apply artificial respiration if necessary and call for medical help.
If the condensed gas comes into contact with eyes and skin: This may result in freezing or cold burns. Alter contact wash with copious amounts of water and seek medical help.

5. FIRE-PREVENTION MEASURES

Avoid naked flames, sparks and cigarettes and switch off other sources of ignition. In the case of fire call the fire brigade immediately and inform them of the presence of the flammable gas.
If the gas ignites, do not try to extinguish it but make sure than the gas supply is shut off and let the fire burn out. Use water spray to cool storage tanks exposed to heat~ to protect the surrounding area and to protect personnel shutting off the gas supply. For combustion products see point 10.

5. MEASURES TO BE TAKEN ON ESCAPE OF SUBSTANCE

This product has a low flash point and, if it spills or leaks, constitutes a serious fire and explosion hazard. Provide good ventilation, avoid naked flames, sparks and cigarettes and switch off other sources of ignition (motors or electrical equipment). Use water spray to disperse escaped gas and to protect personnel attempting to plug the leek. Vapour is heavier than air and can build up in low areas or spread via drainage systems, tunnels, etc. and thus reach a distant source of ignition. Note the wind direction in which the gas is being dispersed. Wear protective clothing (see point B) and avoid a gas cloud. In the case of a major leak or leak which cannot be plugged, call the fire brigade and warn people downwind.

7. HANDLING AND STORAGE

This condensed gas is stored under pressure. Pressure vessels and equipment must be specifically intended for this product and comply with the legal requirements. Pressure vessels must be placed outside or in well ventilated areas always away from sources of heat and ignition. DO NOT SMOKE. Keep out of the reach of children. Make sure that pressure vessels which are not in use are properly closed. Treat empty pressure vessels as full ones - they still contain vapours. Never carry out work on pressure vessels and equipment - leave this to specialists.
Make sure that equipment is properly earthed to prevent the build-up of static electricity
Avoid contact with liquid and vapour (see point 4).

8. MEASURES TO BE TAKEN TO CONTROL EXPOSURE/PERSONAL PROTECTION

Exposure limit threshold limit value unknown (600 ppm recommended).
Personal protection: Avoid contact of the condensed gas with skin and eyes. Wear long-sleeved clothing, insulating gloves and (safety) glasses. Wear protective shoes (e.g. safety shoes) when handling cylinders. Prevent lengthy inhalation of vapour and spray. Provide good ventilation or use approved protective breathing apparatus when entering gas-filled areas.
Materials which come into contact with this product should be treated as highly inflammable

9. PHYSICAL AND CHEMICAL PROPERTIES

| | | |
|---|---|---|
| Form | | gas condensed to liquid |
| Colour | | colourless |
| Odour low-odour to | | odourless |
| Boiling range at 1 bar | | -1 to -40 C |
| Density | liquid at | 15 ‘C approx. 540 kg/m3 |
| | vapour vs. air | 1.6 to 2.0 |
| Vapour pressure at 20 C | | 300 to 800 kPa |
| Flash point | (ASTM 093) | below 0 ‘C |
| Self-ignition temperature | | above 370 C |
| Explosion limits (in % vol air) | | lower limit 1.5%, upper limit 9.5% |
| Solubility in water at 20 C | | negligible |

10. STABILITY AND REACT1VI1Y
Stable at ambient temperature.
Keep away from *sources* of heat, flame and other sources of ignition.
Avoid contact with strong oxidizing agents.
Incomplete combustion releases poisonous gases, including carbon monoxide.

11. TOXICOLOGICAL INFORMATION
The product is not dangerous in normal use.
Can have an anaesthetizing effect if high vapour concentrations are inhaled.

12 ECOLOGICAL INFORMATION
This product will vaporise and mingle with air and will not penetrate into the ground or seep into water.

13 INSTRUCTIONS FOR REMOVAL
Take all pressure vessels and gas bottles back to your supplier. Empty pressure vessels still contain vapours and are thus inflammable. Warning labels promote safe handling, even for empty packaging: never remove them.

14. INFORMATION CONCERNING TRANSPORT

| | | |
|---|---|---|
| UN number | - | 1965 |
| Rail/mad (RIOIADR) | - | class of risk 2/number and letter 2F |
| Air (lATh) | - | class of risk/division 2 UN 1965 |
| Sea (IMDG) | - | class of risk 2.1 |
| Inland waterways (ADN/ADNRP VGB) | - | class of risk 2/number 3/category B |

15. STATUTORY INFORMATION

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|---|---|
| Symbol F (flame). | risk phrases . R12 |
| Category Extremely flammable | safety phrases: 82, 89, 816 and 833 |

16. OTHER INFORMATION AND REGULATIONS FOR USE IN THE NETHERLANDS

Implementing regulation: propane storage decree.
Guidelines by the commission for the prevention of disasters caused by hazardous substances:

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| CPR 11-1 | The use of propane on construction sites |
| CPR 11-2 | The storage of propane and butane in stationary surface tanks with a content of more than 0.15 $m^3$ and not more than 9 $m^3$. |
| CPR 11-3 | Storage of propane and butane in stationary surface and mound tanks with a content of more than 5 $m^3$ and not more than 150 $m^3$. |

In other countries you should ask about additional regulations at local/national authorities.