

SAFETY DATA SHEET

1. IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product identifier

Product Name

Klea™ 448A

Use

Subject to Member State regulations, applicable uses are: refrigerant

Manufacturer

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2. HAZARDS IDENTIFICATION

Low acute toxicity. High exposures may cause an abnormal heart rhythm and prove suddenly fatal. Very high atmospheric concentrations may cause anaesthetic effects and asphyxiation. Liquid splashes or spray may cause freeze burns to skin and eyes.

Classification of the substance or mixture

Regulation (EC) No. 1272/2008 (CLP)

Gases under pressure - Liquefied gas

Label elements

According to Regulation (EC) No. 1272/2008 (CLP)

Hazard Pictogram(s)



GHS04

Signal Word(s)

Warning

Hazard Statement(s)

H280: Contains gas under pressure; may explode if heated.

Precautionary Statement(s)

P410+P403: Protect from sunlight. Store in a well-ventilated place.

3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENT(S)

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Hazardous Ingredient(s)	%(w/w)	CAS No.	EC No.	Hazard symbol(s) and hazard statement(s)
Difluoromethane (HFC 32)	26	000075-10-5	200-839-4	GHS02, GHS04; H220, H280
trans-1,3,3,3-Tetrafluoroprop-1-ene (HFO 1234 ze-E)	7	29118-24-9	471-480-0	GHS04; H280
1,1,1,2-tetrafluoroethane (HFC 134a)	21	000811-97-2	212-377-0	GHS04; H280
Pentafluoroethane (HFC 125)	26	000354-33-6	206-557-8	GHS04; H280
HFO 1234 yf (2,3,3,3-Tetrafluoropropene)	20	000754-12-1	468-710-7	GHS02, GHS04; H220, H280

4. FIRST AID MEASURES



The first aid advice given for skin contact, eye contact, and ingestion is applicable following exposures to the liquid or spray. See also section 11.

Description of first aid measures

Inhalation	Remove patient from exposure, keep warm and at rest. Administer oxygen if necessary. Apply artificial respiration if breathing has ceased or shows signs of failing. In the event of cardiac arrest apply external cardiac massage. Obtain immediate medical attention.
Skin Contact	Thaw affected areas with water. Remove contaminated clothing. Caution: clothing may adhere to the skin in the case of freeze burns. After contact with skin, wash immediately with plenty of warm water. If irritation or blistering occur obtain medical attention.
Eye Contact	Immediately irrigate with eyewash solution or clean water, holding the eyelids apart, for at least 10 minutes. Obtain immediate medical attention.
Ingestion	Unlikely route of exposure. Do not induce vomiting. Provided the patient is conscious, wash out mouth with water and give 200-300 ml (half a pint) of water to drink. Obtain immediate medical attention.
Further Medical Treatment	Symptomatic treatment and supportive therapy as indicated. Adrenaline and similar sympathomimetic drugs should be avoided following exposure as cardiac arrhythmia may result with possible subsequent cardiac arrest.
Most important symptoms and effects, both acute and delayed	High exposures may cause an abnormal heart rhythm and prove suddenly fatal. Very high atmospheric concentrations may cause anaesthetic effects and asphyxiation.
Indication of any immediate medical attention and special treatment needed	Remove patient from exposure, keep warm and at rest. Administer oxygen if necessary. Apply artificial respiration if breathing has ceased or shows signs of failing. In the event of cardiac arrest apply external cardiac massage. Obtain immediate medical attention.

5. FIREFIGHTING MEASURES

General	This refrigerant is not flammable in air under ambient conditions of temperature and pressure. Certain mixtures of this refrigerant and air when under pressure may be flammable. Mixtures of this refrigerant and air under pressure should be avoided. Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions.
Extinguishing media	As appropriate for surrounding fire. Keep fire exposed containers cool by spraying with water.
Special hazards arising from the substance or mixture	Thermal decomposition will evolve very toxic and corrosive vapours. (hydrogen fluoride) Containers may burst if overheated.
Advice for firefighters	A self contained breathing apparatus and full protective clothing must be worn in fire conditions. See Also Section 8

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	Ensure suitable personal protection (including respiratory protection) during removal of spillages. See Also Section 8
Environmental precautions	Prevent liquid from entering drains, sewers, basements and workpits since the vapour may create a suffocating atmosphere.
Methods and materials for containment and cleaning up	Provided it is safe to do so, isolate the source of the leak. Allow small spillages to evaporate provided there is adequate ventilation. Large spillages: Ventilate area. Contain spillages with sand, earth or any suitable adsorbent material. Prevent liquid from entering drains, sewers, basements and workpits since the vapour may create a suffocating atmosphere.
Reference to other sections	8,13

7. HANDLING AND STORAGE

Precautions for safe handling	<p>Avoid inhalation of high concentrations of vapours. Atmospheric levels should be controlled in compliance with the occupational exposure limit. Atmospheric concentrations well below the occupational exposure limit can be achieved by good occupational hygiene practice.</p> <p>The vapour is heavier than air, high concentrations may be produced at low levels where general ventilation is poor, in such cases provide adequate ventilation or wear suitable respiratory protective equipment with positive air supply.</p> <p>Avoid contact with naked flames and hot surfaces as corrosive and very toxic decomposition products can be formed.</p> <p>Avoid contact between the liquid and skin and eyes.</p> <p>For correct refrigerant composition, systems should be charged using the liquid phase and not the vapour phase.</p> <p>Avoid venting to atmosphere.</p> <p>This fluorinated greenhouse gas may be supplied in returnable containers (cylinders). The container contains fluorinated greenhouse gases covered by the Kyoto Protocol. The fluorinated greenhouse gases in containers may not be vented to the atmosphere. Regulation (EU) No. 517/2014 of the European Parliament and the Council on certain fluorinated greenhouse gases.</p>
Process Hazards	<p>Liquid refrigerant transfers between refrigerant containers and to and from systems can result in static generation. Ensure adequate earthing. Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions.</p> <p>Care must be taken to mitigate the risk of developing high pressures in systems caused by a temperature rise when liquid is trapped between closed valves or in cases where containers have been overfilled.</p>
Conditions for safe storage, including any incompatibilities	<p>Keep in a well ventilated place away from fire risk and avoid sources of heat such as electric or steam radiators.</p> <p>Avoid storing near to the intake of air conditioning units, boiler units and open drains.</p>
Specific use	Subject to Member State regulations, applicable uses are: refrigerant

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure controls

Occupational Exposure Limits

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Occupational Exposure Limits	CAS No.	LTEL (8 hr TWA ppm)	LTEL 8 hr TWA mg/m ³	STEL (ppm)	STEL mg/m ³	Note
Difluoromethane (HFC 32)	000075-10-5	1000	-	-	-	COM
trans-1,3,3,3-Tetrafluoroprop-1-ene (HFO 1234 ze-E)	29118-24-9	500	-	-	-	COM (provisional)
1,1,1,2-Tetrafluoroethane (HFC 134a)	000811-97-2	1000	4240	-	-	WEL
Pentafluoroethane (HFC 125)	000354-33-6	1000	-	-	-	COM
HFO 1234 yf (2,3,3,3-Tetrafluoropropene)	000754-12-1	500	-	-	-	AIHA WEEL

Appropriate engineering controls

Provide adequate ventilation. Atmospheric levels should be controlled in compliance with the occupational exposure limit.

Personal protection equipment

Wear suitable protective clothing and eye/face protection.



Respirators

In cases of insufficient ventilation, where exposure to high concentrations of vapour is possible, suitable respiratory protective equipment with positive air supply should be used.



Eye Protection

Wear protective eyewear (goggles, face shield, or safety glasses).



Gloves

Wear thermal insulating gloves and a face shield when handling liquified gases.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form	liquefied gas
Colour.	colourless
Odour	slight ethereal
Solubility (Water)	insoluble
Solubility (Other)	Soluble in: alcohols , chlorinated solvents , esters
Boiling Point (° C)	-45.9 to -39.8
Vapour Density (Air=1)	3.7 at 20 ° C
Vapour Pressure (mm Hg)	8312 at 20 ° C
Density (g/ml)	1.16 at 20 ° C

10. STABILITY AND REACTIVITY

Reactivity

See Section: Possibility of hazardous reactions

Chemical stability

Stable under normal conditions.

Possibility of hazardous reactions

Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions.
Incompatible materials: finely divided metals , magnesium and alloys containing more than 2% magnesium . Can react violently if in contact with alkali metals and alkaline earth metals - sodium , potassium , barium

Conditions to avoid

Avoid high temperatures.

Incompatible materials

finely divided metals , alkali metals (sodium , potassium) , alkaline earth metals (barium , magnesium) , alloys containing more than 2% magnesium

Hazardous decomposition products

hydrogen fluoride by thermal decomposition and hydrolysis.

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11. TOXICOLOGICAL INFORMATION

Acute toxicity / Ingestion	Highly unlikely - but should this occur freeze burns will result.
Inhalation / Acute toxicity	HFC 32 : LC50 (rat) (4 hrs) > 520000 ppm (1107600 mg/m ³) HFC 125 : LC50 (rat) (4 hrs) > 800000 (3928000 mg/m ³) HFC 134a : LC50 (rat) (4 hrs) > 500000 (2080000 mg/m ³) HFO 1234yf: LC50 (rat) (4 hrs) > 400000 ppm HFO 1234ze-E: LC50 (rat) (4 hrs) > 207000 ppm Very high atmospheric concentrations may cause anaesthetic effects and asphyxiation. High exposures may cause an abnormal heart rhythm and prove suddenly fatal.
Acute toxicity / Skin Contact	Unlikely to be hazardous by skin absorption.
Skin corrosion/irritation	Liquid splashes or spray may cause freeze burns.
Serious eye damage/irritation	Liquid splashes or spray may cause freeze burns.
Respiratory irritation	Non-irritant
Sensitisation	It is not a skin sensitiser.
Repeated dose toxicity	HFC 32 : An inhalation study in animals has shown that repeated exposures produce no significant effects (49500ppm in rats). HFC 125 : An inhalation study in animals has shown that repeated exposures produce no significant effects (50000ppm in rats). HFC 134a : An inhalation study in animals has shown that repeated exposures produce no significant effects (50000ppm in rats). HFO 1234 yf: An inhalation study in animals has shown that repeated exposures produce no significant effects (50000ppm in rats). HFO 1234 ze-E: A 90-day repeated inhalation study in animals has shown no adverse effects at levels upto 5000ppm.
Mutagenicity	HFC 32 , HFC 125 , HFC 134a , HFO 1234 ze-E: No evidence of mutagenic effects. HFO 1234yf: Whilst there was some evidence of genotoxicity in a short-term bacterial assay, there was no activity in a chromosome aberration test and in-vivo micronucleus tests in the rat and mouse.
Carcinogenicity	It is unlikely to present a carcinogenic hazard to man. HFC 134a : A lifetime inhalation study in rats has shown that exposure to 50000ppm resulted in benign tumours of the testis. The increased tumour incidence was observed only after prolonged exposure to high levels, and is considered not to be of relevance to humans occupationally exposed to HFC 134a at or below the occupational exposure limit.
Reproductive toxicity	HFC 32 , HFC 125 , HFC 134a , HFO 1234yf, HFO 1234 ze-E: Studies in animals have shown that repeated exposures produce no teratogenic effects.
Specific target organ toxicity — single exposure	Not classified
Specific target organ toxicity — repeated exposure	Not classified
Aspiration hazard	Not applicable

12. ECOLOGICAL INFORMATION

Toxicity	The product is predicted to have low toxicity to aquatic organisms.
Environmental Fate and Distribution	Gas.

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Persistence and Degradation	<p>HFC 32 : Decomposed comparatively rapidly in the lower atmosphere (troposphere). Atmospheric lifetime is 4.9 years.</p> <p>HFO 1234 ze-E : Decomposed rapidly in the lower atmosphere (troposphere). Atmospheric lifetime is 10 days. May influence photochemical smog (i.e. may be a VOC under the terms of the UNECE agreement).</p> <p>HFC 134a : Decomposed comparatively rapidly in the lower atmosphere (troposphere). Atmospheric lifetime is 14 years.</p> <p>HFC 125 : Decomposed slowly in the lower atmosphere (troposphere). Atmospheric lifetime is 29 years.</p> <p>HFO 1234yf: Decomposed rapidly in the lower atmosphere (troposphere). Atmospheric lifetime is < 20 days. May influence photochemical smog (i.e. may be a VOC under the terms of the UNECE agreement).</p> <p>R448A: Does not deplete ozone. Has a Global Warming Potential (GWP) of 1301 (relative to a value of 1 for carbon dioxide at 100 years).</p>
Bioaccumulative potential	The product has no potential for bioaccumulation.
Mobility in soil	Not applicable.
Results of PBT and vPvB assessment	Not classified as PBT or vPvB.
Other adverse effects	None known.
Effect on Effluent Treatment	Discharges of the product will enter the atmosphere and will not result in long term aqueous contamination.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods	Best to recover and recycle. If this is not possible, destruction is to be in an approved facility which is equipped to absorb and neutralise acid gases and other toxic processing products.
Regulatory Information	Disposal should be in accordance with local, state or national legislation.

14. TRANSPORT INFORMATION

Hazard label(s)



Road/Rail	
UN No.	3163
ADR/RID Class	2.2
ADR/RID Proper Shipping Name	LIQUEFIED GAS, N.O.S. (trans-1,3,3,3-TETRAFLUOROPROP-1-ENE, 1,1,1,2-TETRAFLUOROETHANE, DIFLUOROMETHANE, PENTAFLUOROETHANE, 2,3,3,3-TETRAFLUOROPROPENE MIXTURE)
SEA	
IMDG Class	2.2
Marine Pollutant	Not classified as a Marine Pollutant
AIR	
ICAO/IATA Class	2.2

15. REGULATORY INFORMATION

European Regulations

Regulation (EC) No. 1272/2008 (CLP)

Gases under pressure - Liquefied gas

Special Restrictions:

This fluorinated greenhouse gas may be supplied in returnable containers (cylinders). The container contains fluorinated greenhouse gases covered by the Kyoto Protocol. The fluorinated greenhouse gases in containers may not be vented to the atmosphere.

Regulation (EU) No. 517/2014 of the European Parliament and the Council on certain fluorinated greenhouse gases.

Directive 2006/40/EC of the European Parliament and the Council relating to emissions from air-conditioning systems in motor vehicles and amending Council Directive 70/156/EC.

16. OTHER INFORMATION

This data sheet was prepared in accordance with Regulation (EC) No. 1907/2006.

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Glossary

WEL: Workplace Exposure Limit (UK HSE EH40)

COM: The company aims to control exposure in its workplace to this limit

TLV: The company aims to control exposure in its workplace to the ACGIH limit

TLV-C: The company aims to control exposure in its workplace to the ACGIH Ceiling limit

MAK: The company aims to control exposure in its workplace to the German limit

Sk: Can be absorbed through skin

Sen: Capable of causing respiratory sensitisation

Bmgv: Biological monitoring guidance value (UK HSE EH40)

Hazard Statement(s)

H220: Extremely flammable gas.

H280: Contains gas under pressure; may explode if heated.