Product: Klea® Edge™ 444A

ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 2020/878

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

1.1 Product identifier

Product Name	Klea® Edge™ 444A
CAS No.	Not available.
EC No.	Not available.
REACH Registration No.	HFC 32: EU: 01-2119471312-47-0018
	HFC 152a: EU: 01-2119474440-43-0013
	HFO 1234ze-E: EU: 01-0000019758-54-0003
Other means of identification	UFI: 3371-204R-V00X-S1T4

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

Identified Use(s)	Subject to Member State regulations, applicable uses are: refrigerant.
Uses Advised Against	Not known.

1.3 Details of the supplier of the safety data sheet

Company Identification	Orbia Fluor & Energy Materials
Address	Mexichem Fluor EU BV
	Schiphol Boulevard 425
	Schiphol
	Netherlands
Postal code	1118 BK
Telephone:	+31 887473733
E-mail	info@orbia-fem.com

1.4 Emergency telephone number

Emergency Phone No.	+44 20 3885 0382

SECTION 2: HAZARDS IDENTIFICATION

Flammable liquefied gas. Low acute toxicity. Very high atmospheric concentrations may cause an abnormal heart rhythm, anaesthetic effects and asphyxiation. Liquid splashes or spray may cause freeze burns to skin and eyes.

2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008 (CLP)	Flam. Gas 1B :Flammable gas.
	Press. Gas (Liq.) :Contains gas under pressure; may explode if heated.

2.2 Label elements

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

Product Name	Klea® Edge™ 444A
Hazard Pictogram(s)	 GHS02  GHS04
Signal Word(s)	Danger

Hazard Statement(s)	H221: Flammable gas. H280: Contains gas under pressure; may explode if heated.
Precautionary Statement(s)	P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. P381: In case of leakage, eliminate all ignition sources. P410+P403: Protect from sunlight. Store in a well-ventilated place.

2.3 Other hazards

Does not cause endocrine disruption.
Not classified as PBT or vPvB.
Has a Global Warming Potential (GWP) of 88 (relative to a value of 1 for carbon dioxide at 100 years) according to Annex I and Annex II of Regulation (EU) No. 2024/573 on certain fluorinated greenhouse gases.

2.4 Additional Information

None.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Not applicable.

3.2 Mixtures

HAZARDOUS INGREDIENT(S)	%W/W	CAS No.	EC No.	Hazard Pictogram(s) and Hazard Statement(s)
trans-1,3,3,3-Tetrafluoroprop-1-ene (HFO 1234 ze-E)	83	29118-24-9	471-480-0	GHS04 H280
Difluoromethane (HFC 32)	12	75-10-5	200-839-4	GHS02 H221 GHS04 H280
1,1-Difluoroethane (HFC 152a)	5	75-37-6	200-866-1	GHS02 H220 GHS04 H280

SECTION 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

4.1 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.

4.2 Most important symptoms and effects, both acute and delayed

None anticipated.

4.3 Indication of any immediate medical attention and special treatment needed

Unlikely to be required but if necessary treat symptomatically.

SECTION 5: FIREFIGHTING MEASURES

Flammable. Certain mixtures of HFOs and chlorine may be flammable or reactive under certain conditions.

5.1 Extinguishing media

Suitable Extinguishing media	Allow gas fires to burn until exhausted. Keep fire exposed containers cool by spraying with water.
Unsuitable extinguishing media	None.

5.2 Special hazards arising from the substance or mixture

Combustion or thermal decomposition will evolve very toxic and corrosive vapours. (hydrogen fluoride). Containers may burst if overheated.

5.3 Advice for firefighters

A self contained breathing apparatus and full protective clothing must be worn in fire conditions. See Also Section 8

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Eliminate sources of ignition. Ensure suitable personal protection (including respiratory protection) during removal of spillages. See Also Section 8

6.2 Environmental precautions

Prevent liquid from entering drains, sewers, basements and workpits since the vapour may create a suffocating atmosphere.

6.3 Methods and material 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.

6.4 Reference to other sections

See Also Section 8, 13.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

	Keep away from sources of ignition - No smoking. Take precautionary measures against static discharges. Avoid inhalation of high concentrations of vapours. Atmospheric levels should be controlled in compliance with the occupational exposure limit. 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. Avoid contact between the liquid and skin and eyes. For correct refrigerant composition, systems should be charged using the liquid phase and not the vapour phase.
Process Hazards	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. 2024/573 of the European Parliament and the Council on certain fluorinated greenhouse gases. Liquid refrigerant transfers between refrigerant containers and to and from systems can result in static generation. Ensure adequate earthing. Certain mixtures of HFOs and chlorine may be flammable or reactive under certain conditions. 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.

7.2 Conditions for safe storage, including any incompatibilities

	Keep in a well ventilated place away from fire risk and avoid sources of heat such as electric or steam radiators. Avoid storing near to the intake of air conditioning units, boiler units and open drains.
Storage temperature	Avoid high temperatures.
Storage life	Stable under normal conditions.
Incompatible materials	finely divided metals, alkali metals (sodium, potassium), alkaline earth metals (barium, magnesium), alloys containing more than 2% magnesium.

7.3 Specific end use(s)

Subject to Member State regulations, applicable uses are: refrigerant.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Occupational Exposure Limits

SUBSTANCE	CAS No.	LTEL (8 hr TWA ppm)	LTEL (8 hr TWA mg/m³)	STEL (ppm)	STEL (mg/m³)	Note
trans-1,3,3,3-Tetrafluoroprop-1-ene (HFO 1234 ze-E)	29118-24-9	500				COM (provisional)
Difluoromethane (HFC 32)	75-10-5	1000				COM
1,1-Difluoroethane (HFC 152a)	75-37-6	1000				COM

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

8.2 Exposure controls

8.2.1. Appropriate engineering controls	Provide adequate ventilation. Atmospheric levels should be controlled in compliance with the occupational exposure limit.
8.2.2. Personal protection equipment	Wear suitable protective clothing and eye/face protection.
 Eye Protection	Wear protective eyewear (goggles, face shield, or safety glasses).
 Skin protection	Wear thermal insulating gloves when handling liquefied gases.
 Respiratory protection	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.
 Thermal hazards	See above - Skin protection
8.2.3. Environmental Exposure Controls	Prevent liquid from entering drains, sewers, basements and workpits since the vapour may create a suffocating atmosphere.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Liquefied gas. Colour: Colourless.
Odour	Slight ethereal
Odour threshold	No information available.
pH	Not applicable.
Melting point/freezing point	No information available.
Initial boiling point and boiling range	-34.3 – -24.2°C (bubble to dew point)
Flash Point	Not applicable.
Evaporation rate	Not applicable.
Flammability (solid, gas)	Flammable gas.
Upper/lower flammability or explosive limits	Flammable Limits (Upper) (%v/v): 13.1 @ 23°C ASHRAE Standard 34 Flammable Limits (Lower) (%v/v): 8.2 @ 23°C ASHRAE Standard 34
Vapour pressure	4474 mm Hg @ 20°C
Vapour density	3.7 at bubble point temperature
Density (g/ml)	1.16 @ 20°C
Relative density	No information available.
Solubility(ies)	Solubility (Water) : Insoluble. Solubility (Other) : Soluble in: Alcohols, Chlorinated solvents, esters.
Partition coefficient: n-octanol/water	No information available.
Auto-ignition temperature	No information available.
Decomposition Temperature (°C)	No information available.

Viscosity	Not applicable.
Explosive properties	Not explosive.
Oxidising properties	Not oxidising.

9.2 Other information

Burning velocity	Burning velocity <4 cm/s @23°C (dry air, vertical tube apparatus)

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity

See Section: Possibility of hazardous reactions

10.2 Chemical Stability

Stable under normal conditions.

10.3 Possibility of hazardous reactions

Certain mixtures of HFOs 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.

10.4 Conditions to avoid

Avoid high temperatures.

10.5 Incompatible materials

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

10.6 Hazardous decomposition products

hydrogen fluoride by thermal decomposition and hydrolysis.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity - Ingestion	Highly unlikely - but should this occur freeze burns will result.
Acute toxicity - Skin Contact	Unlikely to be hazardous by skin absorption.
Acute toxicity - Inhalation	Low acute toxicity. HFO 1234 ze-E: LC50 (rat) (4hr) > 207000 ppm HFC 32: LC50 (rat) (4hr) > 520000 ppm HFC 152a: LC50 (rat) (4hr) > 437000 ppm Very high atmospheric concentrations may cause an abnormal heart rhythm, anaesthetic effects and asphyxiation.
Skin corrosion/irritation	Liquid splashes or spray may cause freeze burns.
Serious eye damage/irritation	Liquid splashes or spray may cause freeze burns.
Skin sensitization data	It is not a skin sensitiser.
Respiratory sensitization data	Not classified.
Germ cell mutagenicity	There is no evidence of mutagenic potential.
Carcinogenicity	No evidence of carcinogenicity.
Reproductive toxicity	No evidence of reproductive effects.
Lactation	Not classified.
STOT - single exposure	Not classified.

STOT - repeated exposure	Not classified.
Aspiration hazard	Not applicable.

11.2 Other information

Endocrine disrupting properties	
	Does not cause endocrine disruption.
Respiratory irritation	Non-irritant
Long Term Exposure	HFO 1234 ze-E: A 90-day repeated inhalation study in animals has shown no adverse effects at levels upto 5000ppm. HFC 32: An inhalation study in animals has shown that repeated exposures produce no significant effects (49500ppm in rats). HFC 152a: An inhalation study in animals has shown that repeated exposures produce no significant effects (25000ppm in rats).

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

	The product is predicted to have low toxicity to aquatic organisms.
Toxicity - Aquatic invertebrates	Low toxicity to aquatic invertebrates.
Toxicity - Fish	Low toxicity to fish.
Toxicity - Algae	Low toxicity to algae.
Toxicity - Sediment Compartment	Not classified.
Toxicity - Terrestrial Compartment	Not classified.
Environmental Fate and Distribution	Gas.

12.2 Persistence and Degradation

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).
HFC 32: Decomposed comparatively rapidly in the lower atmosphere (troposphere). Atmospheric lifetime is 4.9 years.
HFC 152a: Decomposed comparatively rapidly in the lower atmosphere (troposphere). Atmospheric lifetime is 1.4 years.
Klea® Edge™ 444A: Does not deplete ozone. Has a Global Warming Potential (GWP) of 88 (relative to a value of 1 for carbon dioxide at 100 years) according to Annex I and Annex II of Regulation (EU) No. 2024/573 on certain fluorinated greenhouse gases.

12.3 Bioaccumulative potential

The product has no potential for bioaccumulation.

12.4 Mobility in soil

Not applicable.

12.5 Results of PBT and vPvB assessment

Not classified as PBT or vPvB.

12.6 Endocrine disrupting properties

Does not cause endocrine disruption.

12.7 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.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 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.
13.2 Additional Information	Disposal should be in accordance with local, state or national legislation.

SECTION 14: TRANSPORT INFORMATION

14.1 UN number

UN No.	3161

14.2 UN proper shipping name

UN proper shipping name	LIQUEFIED GAS, FLAMMABLE, N.O.S. (trans-1,3,3,3-TETRAFLUOROPROP-1-ENE, DIFLUOROMETHANE, 1,1-DIFLUOROETHANE MIXTURE)

14.3 Transport hazard class(es)

ADR/RID	
ADR/RID Class	2.1
IMDG	
IMDG Class	2.1
ICAO/IATA	
ICAO/IATA Class	2.1
Labels	

14.4 Packing group

Packing group	Not applicable.

14.5 Environmental hazards

Environmental hazards	Not classified as a Marine Pollutant.

14.6 Special precautions for user

Special precautions for user	Not known.

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code

Transport in bulk according to Annex II of Marpol and the IBC Code	Not applicable.

SECTION 15: REGULATORY INFORMATION

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

European Regulations

EC Classification	According to Regulation (EC) No. 1272/2008 (CLP) Flam. Gas 1B 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. 2024/573 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. Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC.

15.2 Chemical Safety Assessment

A chemical safety assessment is not required under REACH.

SECTION 16: OTHER INFORMATION

The following sections contain revisions or new statements: 1,16

LEGEND

Hazard Statement(s)	H220: Extremely flammable gas. H221: Flammable gas. H280: Contains gas under pressure; may explode if heated.
Acronyms	ADR : European Agreement concerning the International Carriage of Dangerous Goods by Road CAS : Chemical Abstracts Service CLP : Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures EC : European Community IATA : International Air Transport Association IBC : Intermediate Bulk Container ICAO : International Civil Aviation Organization IMDG : International Maritime Dangerous Goods LTEL : Long term exposure limit

PBT : Persistent, Bioaccumulative and Toxic
REACH : Registration, Evaluation, Authorisation and Restriction of Chemicals
RID : Regulations concerning the International Carriage of Dangerous Goods by Rail
STEL : Short term exposure limit
STOT : Specific Target Organ Toxicity
UFI: Unique Formula Identifier
UN : United Nations
vPvB : very Persistent and very Bioaccumulative

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