

## Product: Klea® Edge™ 444A

ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) &amp; 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<br>HFC 152a: EU: 01-2119474440-43-0013<br>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<br>Schiphol Boulevard 425<br>Schiphol<br>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.<br>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

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|                            |                                                                                                                                                                                                                                                                                                                           |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hazard Statement(s)        | H221: Flammable gas.<br>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.<br>P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.<br>P381: In case of leakage, eliminate all ignition sources.<br>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<br>GHS04 H280                    |
| 1,1-Difluoroethane (HFC 152a)                       | 5    | 75-37-6    | 200-866-1 | GHS02 H220<br>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.                                                                                                                      |

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|                                                                                       |                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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. |
| <b>4.2 Most important symptoms and effects, both acute and delayed</b>                | None anticipated.                                                                                                                                                                                                      |
| <b>4.3 Indication of any immediate medical attention and special treatment needed</b> | 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.<br>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**

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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.

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**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<br>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.<br>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.                                                                                                         |

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|                              |                                                                   |
|------------------------------|-------------------------------------------------------------------|
| Viscosity                    | Not applicable.                                                   |
| Explosive properties         | Not explosive.                                                    |
| Oxidising properties         | Not oxidising.                                                    |
| <b>9.2 Other information</b> |                                                                   |
| 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.<br>HFO 1234 ze-E: LC50 (rat) (4hr) > 207000 ppm<br>HFC 32: LC50 (rat) (4hr) > 520000 ppm<br>HFC 152a: LC50 (rat) (4hr) > 437000 ppm<br>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 sensitizer.                                                                                                                                                                                                                                              |
| 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.                                                                                                                                                                                                                                                           |

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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**

Toxicity - Aquatic invertebrates

The product is predicted to have low toxicity to aquatic organisms.

Toxicity - Fish

Low toxicity to aquatic invertebrates.

Toxicity - Algae

Low toxicity to fish.

Toxicity - Sediment Compartment

Low toxicity to algae.

Toxicity - Terrestrial Compartment

Not classified.

Environmental Fate and Distribution

Not classified.

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.

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**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 Not applicable.

Marpol and the IBC Code



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**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

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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

## Disclaimers

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