

## SAFETY DATA SHEET

## R454C

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

## 1.1. Product identifier

## Trade name

R454C

## Unique formula identifier (UFI)

D000-A0PG-V00U-226P

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

## Relevant identified uses of the substance or mixture

Refrigerant

Restricted to professional users.

## Uses advised against

Consumer uses: Private households (= general public = consumers)

## 1.3. Details of the supplier of the safety data sheet

## Company and address

**Darment Oy**

Ruosilantie 18

00390 Helsinki

Finland

+358 20 558 8250

www.darment.eu

## E-mail

info@darment.fi

## Revision

04/12/2024

## SDS Version

1.0

## 1.4. Emergency telephone number

HUS Poison Information Center, 24h 0800 147 111

Poison Information Center / HUS, Tukholmankatu 17, 00029 HUS (Helsinki)

See first aid measures section 4.

## SECTION 2: Hazards identification

Classified according to Regulation (EC) No. 1272/2008 (CLP).

## 2.1. Classification of the substance or mixture

Flam. Gas 1B; H221, Flammable gas

Press. Gas (Liq.); H280, Contains gas under pressure; may explode if heated.

## 2.2. Label elements

## Hazard pictogram(s)



## Signal word

Danger

## Hazard statement(s)

Flammable gas (H221)

Contains gas under pressure; may explode if heated. (H280)

## Precautionary statement(s)

General

-

Prevention

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. (P210)

#### Response

Leaking gas fire: Do not extinguish, unless leak can be stopped safely. (P377)

In case of leakage, eliminate all ignition sources. (P381)

#### Storage

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

#### Disposal

-

#### Hazardous substances

2,3,3,3-Tetrafluoropropene

Difluoromethane

#### Additional labelling

Contains fluorinated greenhouse gases.

### 2.3. Other hazards

#### Additional warnings

In the event of leaks, high concentrations of gases can quickly form. They can be toxic, asphyxiating, or explosive.

This mixture/product does not contain any substances known to fulfil the criteria for PBT and vPvB classification.

This product does not contain any substances considered to be endocrine disruptors in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2023/707.

## SECTION 3: Composition/information on ingredients

### 3.1. Substances

Not applicable. This product is a mixture.

### 3.2. Mixtures

Product/substance	Identifiers	% w/w	Classification	Note
2,3,3,3-Tetrafluoropropene	CAS No.: 754-12-1 EC No.: 468-710-7 REACH: 01-0000019665-61-XXXX Index No.:	76,5-80,5%	Flam. Gas 1B, H221 Press. Gas (Liq.) , H280	
Difluoromethane	CAS No.: 75-10-5 EC No.: 200-839-4 REACH: 01-2119471312-47-XXXX Index No.:	19,5-23,5%	Flam. Gas 1B, H221 Press. Gas (Liq.) , H280	

See full text of H-phrases in section 16. Occupational exposure limits are listed in section 8, if these are available.

### Other information

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## SECTION 4: First aid measures

### 4.1. Description of first aid measures

#### General information

In the case of accident: Contact a doctor or casualty department – take the label or this safety data sheet. Contact a doctor if in doubt about the injured person's condition or if the symptoms persist. Never give an unconscious person water or other drink.

#### Inhalation

Upon breathing difficulties or irritation of the respiratory tract: Bring the person into fresh air and stay with him/her.

#### Skin contact

Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.

#### Eye contact

If in eyes: Flush eyes with water or saline water (20-30 °C) for at least 5 minutes. Remove contact lenses. Seek medical assistance and continue flushing during transport.

#### Ingestion

Exposure is not likely due to the physical state of the product (gas).

#### Burns

Rinse with water until pain stops then continue to rinse for 30 minutes.

#### 4.2. Most important symptoms and effects, both acute and delayed

None known.

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

Treat symptomatically.

#### Information to medics

Bring this safety data sheet or the label from this product.

### SECTION 5: Firefighting measures

#### 5.1. Extinguishing media

Suitable extinguishing media: Alcohol-resistant foam, carbon dioxide, powder, water mist.

Unsuitable extinguishing media: Waterjets should not be used, since they can spread the fire.

#### 5.2. Special hazards arising from the substance or mixture

Contains gas under pressure; may explode if heated.

Given that it does not present a risk gas supplies shall be disrupted immediately. Removal of pressurized containers or attempting to cool with water shall be entrusted the fire brigade.

If the product is exposed to high temperatures, e.g. in the event of fire, dangerous decomposition compounds are produced. These are:

Halogenated compounds

Carbon oxides (CO / CO<sub>2</sub>)

#### 5.3. Advice for firefighters

Wear self-contained breathing apparatus and protective clothing to prevent contact. Upon direct exposure contact the Poison Information Center on: 09-471977, in order to obtain further advice.

### SECTION 6: Accidental release measures

#### 6.1. Personal precautions, protective equipment and emergency procedures

Accidental releases always pose a serious risk of fire or explosion.

Storages not yet ignited must be cooled by water mist. Remove flammable materials if conditions allow it. Ensure sufficient ventilation.

Disconnect the gas supply provided it does not present a risk. Avoid breathing fumes. Make sure to have a self-contained breathing apparatus available and ready-to-use in the event of an emergency.

#### 6.2. Environmental precautions

In the event of leakage to the surroundings, contact local environmental authorities.

#### 6.3. Methods and material for containment and cleaning up

Disconnect the gas supply. Allow liquefied gas to evaporate and dilute into safe concentration levels in the surrounding atmosphere. If necessary control the dilution of the gas with a mist of water. Ventilate rooms in order to remove the gas.

#### 6.4. Reference to other sections

See section 13 "Disposal considerations" on handling of waste.

See section 8 "Exposure controls/personal protection" for protective measures.

### SECTION 7: Handling and storage

#### 7.1. Precautions for safe handling

Smoking, drinking and consumption of food is not allowed in the work area.

See section 8 "Exposure controls/personal protection" for information on personal protection.

#### 7.2. Conditions for safe storage, including any incompatibilities

Vapours may propagate along the floor. Prevent the forming of flammable or explosive vapour concentrations by applying sufficient ventilation. Do not use this product in close proximity to sources of ignition.

Protect electrical equipment in accordance with current standards. To divert static electricity during transmission, containers must be grounded and connected by wire with the receiving containers. Do not use spark-forming tools. Must be stored in a cool and well-ventilated area, away from possible sources of ignition.

Pressurized gas packs (spray cans, aerosol cans) must be stored behind a wire mesh, which allows gases to escape and holds back packs flying around.

#### Recommended storage material

Keep only in original packaging.

#### Storage conditions

Dry, cool and well ventilated

Protect from sunlight.

**Incompatible materials**

- Strong oxidizing agents
- Combustible materials
- Acids

**7.3. Specific end use(s)**

This product should only be used for applications quoted in section 1.2.

**SECTION 8: Exposure controls/personal protection**

**8.1. Control parameters**

The product contains no substances listed in the Finnish list of substances with occupational exposure limit values.

**DNEL**

2,3,3,3-Tetrafluoropropene

Duration:	Route of exposure:	DNEL:
Long term – Systemic effects - General population	Inhalation	113.1 mg/m <sup>3</sup>
Long term – Systemic effects - Workers	Inhalation	950 mg/m <sup>3</sup>
Short term – Systemic effects - General population	Inhalation	186400 mg/m <sup>3</sup>
Short term – Systemic effects - Workers	Inhalation	186400 mg/m <sup>3</sup>

Difluoromethane

Duration:	Route of exposure:	DNEL:
Long term – Systemic effects - General population	Inhalation	750 mg/m <sup>3</sup>
Long term – Systemic effects - Workers	Inhalation	7035 mg/m <sup>3</sup>

**PNEC**

2,3,3,3-Tetrafluoropropene

Route of exposure:	Duration of Exposure:	PNEC:
Freshwater		100 µg/L
Freshwater sediment		1.51 mg/kg
Intermittent release (freshwater)		1 mg/L
Marine water		10 µg/L
Marine water sediment		151 µg/kg
Soil		1.49 mg/kg

Difluoromethane

Route of exposure:	Duration of Exposure:	PNEC:
Freshwater		142-313 µg/L
Freshwater sediment		534-1806.9 µg/kg
Intermittent release (freshwater)		1.42-3.13 mg/L

**8.2. Exposure controls**

Apply general control to prevent unnecessary exposure

**General recommendations**

Observe general occupational hygiene standards.

**Exposure scenarios**

There are no exposure scenarios implemented for this product.

**Exposure limits**

Occupational exposure limits have not been defined for the substances in this product.

**Appropriate technical measures**

Adequate ventilation must be ensured for all gases. Where natural ventilation is not possible (cellar rooms), artificial ventilation must be installed. It is advantageous to store it in a lattice shed outdoors, as ventilation is no longer necessary in this case.

**Hygiene measures**

In between use of the product and at the end of the working day all exposed areas of the body must be washed thoroughly. Pay special attention to hands, forearms and face.

**Measures to avoid environmental exposure**


No special when used as intended.

### Individual protection measures, such as personal protective equipment


#### Generally

Use only CE marked protective equipment.


#### Respiratory Equipment

Work situation	Type	Class	Colour	Standards	
	Respiratory protection is not needed in the event of adequate ventilation.				
In case of inadequate ventilation	Self contained breathing apparatus			EN137, EN139	
	AX		Brown	EN14387	


#### Skin protection

Recommended	Type/Category	Standards	
Safety shoes	II	EN ISO 20345 / EN ISO 20347	

#### Hand protection

Material	Glove thickness (mm)	Breakthrough time (min.)	Standards	
Gloves	-	-	EN374	

#### Eye protection

Type	Standards	
Face shield alternatively safety glasses with side shields.	EN166	

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

#### Physical state

Gas

#### Colour

Clear, Colourless

#### Odour / Odour threshold

Faint, ether-like

#### pH

Does not apply to gases.

#### Density (g/cm<sup>3</sup>)

Does not apply to gases.

#### Relative density

0.99

#### Kinematic viscosity

Does not apply to gases.

#### Particle characteristics

Does not apply to gases.

#### Phase changes

Melting point/Freezing point (°C)

Does not apply to gases.

Softening point/range (°C)

Does not apply to gases.

Boiling point (°C)

-45.9

Vapour pressure

11.691 hPa (25 °C)

Relative vapour density

3,2

Decomposition temperature (°C)

No relevant or available data due to the nature of the product.

Data on fire and explosion hazards

Flash point (°C)

Does not apply to gases.

Flammability (°C)

The material is ignitable.

Auto-ignition temperature (°C)

444

Lower and upper explosion limit (% v/v)

7.7 - 15.7

Solubility

Solubility in water

No relevant or available data due to the nature of the product.

n-octanol/water coefficient (LogKow)

No relevant or available data due to the nature of the product.

Solubility in fat (g/L)

No relevant or available data due to the nature of the product.

9.2. Other information

Other physical and chemical parameters

No data available.

Oxidizing properties

No relevant or available data due to the nature of the product.

## SECTION 10: Stability and reactivity

10.1. Reactivity

No data available.

10.2. Chemical stability

The product is stable under the conditions, noted in section 7 "Handling and storage".

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources.

Static electricity

10.5. Incompatible materials

Acids

Strong oxidizing agents

Bases

Powdered metals

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced

## SECTION 11: Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity

Product/substance	Difluoromethane
Test method:	OECD 403
Species:	Rat, male/female
Route of exposure:	Inhalation
Test:	LC0 (4 h)

Result: 520 000 ppm

#### Skin corrosion/irritation

Based on available data, the classification criteria are not met.

#### Serious eye damage/irritation

Based on available data, the classification criteria are not met.

#### Respiratory sensitisation

Based on available data, the classification criteria are not met.

#### Skin sensitisation

Based on available data, the classification criteria are not met.

#### Germ cell mutagenicity

Product/substance	Difluoromethane
Test method:	OECD 474
Conclusion:	No adverse effect observed

Product/substance	Difluoromethane
Test method:	OECD 471
Conclusion:	No adverse effect observed

#### Carcinogenicity

Based on available data, the classification criteria are not met.

#### Reproductive toxicity

Product/substance	Difluoromethane
Species:	Rat
Test:	NOAEC
Result:	208 000 mg/m <sup>3</sup>
Conclusion:	No adverse effect observed

#### STOT-single exposure

Based on available data, the classification criteria are not met.

#### STOT-repeated exposure

Based on available data, the classification criteria are not met.

#### Aspiration hazard

Based on available data, the classification criteria are not met.

#### 11.2. Information on other hazards

##### Long term effects

None known.

##### Endocrine disrupting properties

This mixture/product does not contain any substances known to have hormone-disrupting properties in relation to health.

##### Other information

None known.

## SECTION 12: Ecological information

### 12.1. Toxicity

Product/substance	Difluoromethane
Species:	Fish
Duration:	96 hours
Test:	LC50
Result:	1,507 - 1,731 g/L

Product/substance	Difluoromethane
Species:	Daphnia
Duration:	48 hours
Result:	833 mg/L

Product/substance	Difluoromethane
Species:	Algae
Compartment:	Freshwater
Duration:	96 hours
Test:	EC50
Result:	313 mg/L

### 12.2. Persistence and degradability

Product/substance 2,3,3,3-Tetrafluoropropene  
 Result: 0,1982 g/l (24 °C)  
 Conclusion: -

Product/substance Difluoromethane  
 Compartment: Freshwater  
 Conclusion: Not biodegradable

### 12.3. Bioaccumulative potential

Product/substance 2,3,3,3-Tetrafluoropropene  
 LogKow: 2  
 Conclusion: -

### 12.4. Mobility in soil

No data available.

### 12.5. Results of PBT and vPvB assessment

This mixture/product does not contain any substances known to fulfil the criteria for PBT and vPvB classification.

### 12.6. Endocrine disrupting properties

This mixture/product does not contain any substances considered to have endocrine-disrupting properties in relation to the environment.

### 12.7. Other adverse effects

-

### Global warming potential (GWP)

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## SECTION 13: Disposal considerations

### 13.1. Waste treatment methods

Product is covered by the regulations on hazardous waste. (\*)

HP 3 - Flammable

Commission Regulation (EU) No 1357/2014 of 18 December 2014 on waste.

#### EWC code



14 06 01\* Chlorofluorocarbons, HCFC, HFC

### Contaminated packing


#### EWC code

16 05 04\* Gases in pressure containers (including halons) containing dangerous substances

## SECTION 14: Transport information

	14.1 UN / ID	14.2 UN proper shipping name	14.3 Hazard class(es)	14.4 PG*	14.5 Env**	Other information:
ADR	UN3161	LIQUEFIED GAS, FLAMMABLE, N.O.S. (2,3,3,3-Tetrafluoropropene, Difluoromethane)	Transport hazard class: 2 Label: 2.1 Classification code: 2F 	-	No	Limited quantities: 0 Tunnel restriction code: (B/D) See below for additional information
IMDG	UN3161	LIQUEFIED GAS, FLAMMABLE, N.O.S. (2,3,3,3-Tetrafluoropropene, Difluoromethane)	Transport hazard class: 2 Label: 2.1 Classification code: 2F 	-	No	Limited quantities: 0 EmS: F-D S-U See below for additional information



14.1 UN / ID	14.2 UN proper shipping name	14.3 Hazard class(es)	14.4 PG*	14.5 Env**	Other information:
IATA	UN3161 LIQUEFIED GAS, FLAMMABLE, N.O.S. (2,3,3,3-Tetrafluoropropene, Difluoromethane)	Transport hazard class: 2 Label: 2.1 Classification code: 2F 	-	No	See below for additional information

\* Packing group

\*\* Environmental hazards

#### Additional information

This product is within scope of the regulations of transport of dangerous goods.

ADR / See Table A, section 3.2.1 for any information on special provisions, requirements, or warnings in connection with transport. See section 5.4.3, for instructions in writing regarding mitigation of damages in relation to incidents or accidents during transport.

IMDG / See section 3.2.1, for any information on special provisions, requirements, or warnings in connection with transport.

IATA / See Table 4.2 for any information on special provisions, requirements, or warnings in connection with transport.

#### 14.6. Special precautions for user

Not applicable.

#### 14.7. Maritime transport in bulk according to IMO instruments

No data available.

## SECTION 15: Regulatory information

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

#### Restrictions for application

Restricted to professional users.

People under the age of 18 shall not be exposed to this product.

#### Demands for specific education

No specific requirements.

#### SEVESO - Categories / dangerous substances

Liquefied flammable gases - Qualifying quantity (lower-tier): 50 tonnes / (upper-tier): 200 tonnes

#### REACH, Annex XVII

2,3,3,3-Tetrafluoropropene is subject to REACH restrictions (entry 40).

Difluoromethane is subject to REACH restrictions (entry 40).

#### Additional information

Not applicable.

#### Sources

Government Decree 686/2015 amending the Government Decree on Safety Requirements for the Industrial Handling and Storage of Dangerous Chemicals.

Commission Regulation (EU) No 1357/2014 of 18 December 2014 on waste.

REGULATION (EU) No 517/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on fluorinated greenhouse gases.

Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (CLP).

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

### 15.2. Chemical safety assessment

No

## SECTION 16: Other information

Full text of H-phrases as mentioned in section 3

H221, Flammable gas  
H280, Contains gas under pressure; may explode if heated.

#### Abbreviations and acronyms

ADN = European Provisions concerning the International Carriage of Dangerous Goods by Inland Waterway  
ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road  
ATE = Acute Toxicity Estimate  
BCF = Bioconcentration Factor  
CAS = Chemical Abstracts Service  
CE = Conformité Européenne (European conformity)  
CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]  
CSA = Chemical Safety Assessment  
CSR = Chemical Safety Report  
DMEL = Derived Minimal Effect Level  
DNEL = Derived No Effect Level  
EINECS = European Inventory of Existing Commercial chemical Substances  
ES = Exposure Scenario  
EUH statement = CLP-specific Hazard statement  
EuPCS = European Product Categorisation System  
EWC = European Waste Catalogue  
GHS = Globally Harmonized System of Classification and Labelling of Chemicals  
GWP = Global warming potential  
IARC = International Agency for Research on Cancer (IARC)  
IATA = International Air Transport Association  
IBC = Intermediate Bulk Container  
IMDG = International Maritime Dangerous Goods  
LogPow = logarithm of the octanol/water partition coefficient  
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)  
OECD = Organisation for Economic Co-operation and Development  
PBT = Persistent, Bioaccumulative and Toxic  
PNEC = Predicted No Effect Concentration  
RID = The Regulations concerning the International Carriage of Dangerous Goods by Rail  
RRN = REACH Registration Number  
SCL = A specific concentration limit  
SVHC = Substances of Very High Concern  
STOT-RE = Specific Target Organ Toxicity - Repeated Exposure  
STOT-SE = Specific Target Organ Toxicity - Single Exposure  
TWA = Time weighted average  
UN = United Nations  
UVBC = Unknown or variable composition, complex reaction products or of biological materials  
VOC = Volatile Organic Compound  
vPvB = Very Persistent and Very Bioaccumulative

#### Additional information

The classification of the mixture in regard to physical hazards has been based on experimental data.

#### The safety data sheet is validated by

Darment Oy

#### Other

A change (in proportion to the last essential change (first cipher in SDS version, see section 1)) is marked with a triangle.

The information in this safety data sheet applies only to this specific product (mentioned in section 1) and is not necessarily correct for use with other chemicals/products.

It is recommended to hand over this safety data sheet to the actual user of the product. Information in this safety data sheet cannot be used as a product specification.

Country-language: FI-en