SAFETY DATA SHEET

R452A

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

1.1. Product identifier

Trade name

R452A

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

None known.

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

30/12/2024

SDS Version

1.0

Date of previous version

03/05/2024 (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

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

2.2. Label elements

Hazard pictogram(s)

Signal word

Warning

Hazard statement(s)

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

Precautionary statement(s)

General

-

Prevention

-

Response

-

Storage

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

Disposal

-

Hazardous substances

Pentafluoroethane
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
Pentafluoroethane	CAS No.: 354-33-6 EC No.: 206-557-8 REACH: 01-2119485636-25-XXXX Index No.:	57,2-60,8%	Press. Gas (Liq.) , H280	
2,3,3,3-Tetrafluoropropene	CAS No.: 754-12-1 EC No.: 468-710-7 REACH: 01-0000019665-61-XXXX Index No.:	29,0-30,1%	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.:	9,3-12,7%	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

-

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 / CO2)

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.
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

Protect from sunlight.
Dry, cool and well ventilated
< 50°C

Incompatible materials

Powdered metals
Strong oxidizing agents
Reducing agents

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/m³
Long term – Systemic effects - Workers	Inhalation	950 mg/m³
Short term – Systemic effects - General population	Inhalation	186400 mg/m³
Short term – Systemic effects - Workers	Inhalation	186400 mg/m³

Difluoromethane

Duration:	Route of exposure:	DNEL:
Long term – Systemic effects - General population	Inhalation	750 mg/m³
Long term – Systemic effects - Workers	Inhalation	7035 mg/m³

Pentafluoroethane

Duration:	Route of exposure:	DNEL:
Long term – Systemic effects - General population	Inhalation	1753 mg/m³
Long term – Systemic effects - Workers	Inhalation	16444 mg/m³

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

Pentafluoroethane

Route of exposure:	Duration of Exposure:	PNEC:
Freshwater		100 µg/L
Freshwater sediment		600 µg/kg
Intermittent release (freshwater)		1 mg/L

8.2. Exposure controls

Apply general control to prevent unnecessary exposure

General recommendations

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

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	

Skin protection

Recommended	Type/Category	Standards	
Safety shoes	II	EN ISO 20345 / EN ISO 20347	
In the likelihood of direct or incidental exposure, wear whole-body protection, due to the risk of frost bites or skin burns.	-	-	

Hand protection

Material	Glove thickness (mm)	Breakthrough time (min.)	Standards	
Fluoropolymer elastomer (e.g. Viton®)	0,7	> 480	EN374-2, EN374-3, EN388	

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
Colourless

Odour / Odour threshold
Faint, ether-like

pH
Does not apply to gases.

Density (g/cm^3)
1.14

Relative density
Does not apply to gases.

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)
-46.93

Vapour pressure
11.88 bar (25 °C)

▼Relative vapour density
No relevant or available data due to the nature of the product.

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

▼Auto-ignition temperature (°C)
No relevant or available data due to the nature of the product.

▼Lower and upper explosion limit (% v/v)
No relevant or available data due to the nature of the product.

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
Sunlight

10.5. Incompatible materials

Powdered metals
Strong oxidizing agents
Reducing agents

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	Pentafluoroethane
Species:	Rat
Route of exposure:	Inhalation
Test:	LC50 (4 hours)
Result:	800 000 ppm

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	Pentafluoroethane
Species:	Rat
Test:	NOAEC
Result:	245 440 mg/m^3

Product/substance	Difluoromethane
Species:	Rat
Test:	NOAEC
Result:	208 000 mg/m^3
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	Pentafluoroethane
Result:	5 %
Conclusion:	Not biodegradable

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	Pentafluoroethane
LogKow:	1,48
Conclusion:	-

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

12.4. Mobility in soil

Pentafluoroethane

LogKoc = 20, Low mobility potential.

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

None known.

SECTION 13: Disposal considerations

13.1. ▼Waste treatment methods

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

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

EWC code

14 06 01* Chlorofluorocarbons, HCFC, HFC

Contaminated packing

EWC code

14 06 01* Chlorofluorocarbons, HCFC, HFC

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	UN1078	REFRIGERANT GAS, N.O.S. (Pentafluoroethane, 2,3,3,3-Tetrafluoropropene, Difluoromethane)	Transport hazard class: 2 Label: 2.2 Classification code: 2A 	-	No	Limited quantities: 120 ml Tunnel restriction code: (C/E) See below for additional information.
IMDG	UN1078	REFRIGERANT GAS, N.O.S. (Pentafluoroethane, 2,3,3,3-Tetrafluoropropene, Difluoromethane)	Transport hazard class: 2 Label: 2.2 Classification code: 2A 	-	No	Limited quantities: 120 ml EmS: F-C S-V See below for additional information.
IATA	UN1078	REFRIGERANT GAS, N.O.S. (Pentafluoroethane, 2,3,3,3-Tetrafluoropropene, Difluoromethane)	Transport hazard class: 2 Label: 2.2 Classification code: 2A 	-	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.

Demands for specific education

No specific requirements.

SEVESO - Categories / dangerous substances

Not applicable.

▼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

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