

Safety Data Sheet

2,3,3,3-tetrafluoroprop-1-ene

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878

SDS Reference Number: AT-R-1234YF-140

Issue date: 8/19/2015 Revision date: 7/1/2026 Supersedes version of: 12/5/2024 Version: 1.3

Danger



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

1.1. Product identifier

Trade name : Kältemittel R1234yf
SDS no : AT-R-1234YF-140
Other means of identification : 2,3,3,3-tetrafluoroprop-1-ene
CAS-No. : 754-12-1
EC-No. : 468-710-7
EC Index-No. : ---
REACH registration No : 01-0000019665-61
Chemical formula : C3H2F4

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

Relevant identified uses : See the list of identified uses and exposure scenarios in the annex of the safety data sheet.
Uses advised against : Consumer use.

1.3. Details of the supplier of the safety data sheet

Messer Austria GmbH
Industriestraße 5
AT 2352 Gumpoldskirchen
Austria
T +43 (0)50 603-0, F +43 (0)50 603-273
info.at@messergroup.com, www.messer.at

1.4. Emergency telephone number

Emergency telephone number : Vergiftungsinformationszentrale (VIZ): +43 1 406 43 43

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Physical hazards	Flammable gases, Category 1A	H220
	Gases under pressure : Liquefied gas	H280

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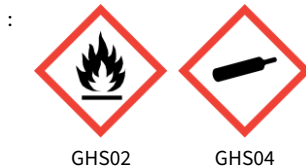
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2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP)



Signal word (CLP)

: Danger

Hazard statements (CLP)

: H220 - Extremely flammable gas.
H280 - Contains gas under pressure; may explode if heated.

Precautionary statements (CLP)

- Prevention : P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
- Response : P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - Eliminate all ignition sources if safe to do so.
- Storage : P403 - Store in a well-ventilated place.

2.3. Other hazards

Asphyxiant in high concentrations.
These high concentrations are within the flammability range.
Contact with the liquid may cause cold burns/frostbite.
Not classified as PBT or vPvB.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP] ATE, EUH-statements, M-Factors
2,3,3,3-tetrafluoroprop-1-ene	CAS-No.: 754-12-1 EC-No.: 468-710-7 EC Index-No.: --- REACH registration No: 01-0000019665-61-	100	Flam. Gas 1A, H220 Press. Gas (Liq.), H280

Full text of H- and EUH-statements: see section 16

Contains no other components or impurities which will influence the classification of the product.

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- Inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.

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- Skin contact : In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance.
Remove contaminated clothing.
- Eye contact : Call a physician immediately.
Immediately flush eyes thoroughly with water for at least 15 minutes.
- Ingestion : Ingestion is not considered a potential route of exposure.

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

See section 11.

In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation.

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

Treat symptomatically. Adrenaline derivatives are contraindicated.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Foam.
Dry powder.
Carbon dioxide.
Be aware of the risk of formation of static electricity with the use of CO2 extinguishers. Do not use them in places where a flammable atmosphere may be present.
- Unsuitable extinguishing media : Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

- Specific hazards : Exposure to fire may cause containers to rupture/explode.
- Hazardous combustion products : Hydrogen fluoride. Carbon monoxide. Carbonyl fluoride.

5.3. Advice for firefighters

- Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.
If possible, stop flow of product.
Use water spray or fog to knock down fire fumes if possible.
Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire.
Move containers away from the fire area if this can be done without risk.
- Special protective equipment for fire fighters : In confined space use self-contained breathing apparatus.
Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.
Standard EN 469 - Protective clothing for firefighters. Standard EN 659 - Protective gloves for firefighters.

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SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Try to stop release.
Evacuate area.
Monitor concentration of released product.
Consider the risk of potentially explosive atmospheres.
Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Eliminate ignition sources.
Ensure adequate air ventilation.
Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
Act in accordance with local emergency plan.
Stay upwind.

6.2. Environmental precautions

Try to stop release.

6.3. Methods and material for containment and cleaning up

Ventilate area.

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Safe use of the product

: Assess the risk of potentially explosive atmospheres and the need for explosion-proof equipment.
Purge air from system before introducing gas.
Take precautionary measures against static discharge.
Keep away from ignition sources (including static discharges).
Consider the use of only non-sparking tools.
Ensure equipment is adequately earthed.
The product must be handled in accordance with good industrial hygiene and safety procedures.
Only experienced and properly instructed persons should handle gases under pressure.
Consider pressure relief device(s) in gas installations.
Ensure the complete gas system was (or is regularly) checked for leaks before use.
Do not smoke while handling product.
Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt.
Avoid suck back of water, acid and alkalis.
Do not breathe gas.
Avoid release of product into work area.

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Safe handling of the gas receptacle

- : Refer to supplier's container handling instructions.
- Do not allow backfeed into the container.
- Protect containers from physical damage; do not drag, roll, slide or drop.
- When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders.
- Leave valve protection caps, when provided, in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use.
- If user experiences any difficulty operating valve discontinue use and contact supplier.
- Never attempt to repair or modify container valves or safety relief devices.
- Damaged valves should be reported immediately to the supplier.
- Keep container valve outlets clean and free from contaminants particularly oil and water.
- Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
- Close container valve after each use and when empty, even if still connected to equipment.
- Never attempt to transfer gases from one cylinder/container to another.
- Never use direct flame or electrical heating devices to raise the pressure of a container.
- Do not remove or deface labels provided by the supplier for the identification of the content of the container.
- Suck back of water into the container must be prevented.
- Open valve slowly to avoid pressure shock.

7.2. Conditions for safe storage, including any incompatibilities

- Observe all regulations and local requirements regarding storage of containers.
- Containers should not be stored in conditions likely to encourage corrosion.
- Container valve guards or caps, when provided, should be in place.
- Containers should be stored in the vertical position and properly secured to prevent them from falling over.
- Stored containers should be periodically checked for general condition and leakage.
- Keep container below 50°C in a well ventilated place.
- Store containers in location free from fire risk and away from sources of heat and ignition.
- Keep away from combustible materials.
- Segregate from oxidant gases and other oxidants in store.
- All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

2,3,3,3-tetrafluoroprop-1-ene (754-12-1)

DNEL: Derived no effect level (Workers)

Long-term - systemic effects, inhalation

950 mg/m³

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2,3,3,3-tetrafluoroprop-1-ene (754-12-1)	
PNEC: Predicted no effect concentration	
Aqua (freshwater)	0.1 mg/l
Aquatic, intermittent releases	1 mg/l

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Provide adequate general and local exhaust ventilation.
Product to be handled in a closed system.
Systems under pressure should be regularly checked for leakages.
Ensure exposure is below occupational exposure limits (where available).
Gas detectors should be used when flammable gases/vapours may be released.
Consider the use of a work permit system e.g. for maintenance activities.

8.2.2. Individual protection measures, e.g. personal protective equipment

A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered:

PPE compliant to the recommended EN/ISO standards should be selected.

• Eye/face protection

: Wear goggles when transfilling or breaking transfer connections.

Standard EN 166 - Personal eye-protection - specifications.

Standard EN ISO 16321-1 - Eye and face protection for occupational use Part 1: General requirements.

• Skin protection

- Hand protection

: Wear working gloves when handling gas containers.

Standard EN 388 - Protective gloves against mechanical risks, performance level 1 or higher.

Recommended types include wrist gloves from leather or synthetic material with equivalent performance, fabric gloves, fabric gloves with leather palms.

Wear cold insulating gloves when transfilling or breaking transfer connections.

Standard EN 511 - Cold insulating gloves, performance level 1 or higher. Recommended types include insulated gauntlets or gloves specifically selected to prevent liquid penetration and ingress of cryogenic liquids and to provide mechanical resistance.

- Other

: Consider the use of flame resistant anti-static safety clothing.

Standard EN ISO 14116 - Limited flame spread materials.

Standard EN 1149-5 - Protective clothing: Electrostatic properties.

Wear safety shoes while handling containers.

Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

• Respiratory protection

: Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmospheres.

Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

• Thermal hazards

: None in addition to the above sections.

8.2.3. Environmental exposure controls

Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance

- Physical state at 20°C / 101.3kPa	: Gas.
- Colour	: Colourless.
Odour	: Ethereal.
Melting point / Freezing point	: Not known.
Boiling point	: -29 °C
Flammability	: Extremely flammable gas.
Lower explosion limit	: Not available
Upper explosion limit	: Not available
Flash point	: Not applicable for gases and gas mixtures.
Auto-ignition temperature	: 405 °C
Decomposition temperature	: Not applicable.
pH	: Not applicable for gases and gas mixtures.
Viscosity, kinematic	: No reliable data available.
Water solubility [20°C]	: 198.2 mg/l
Partition coefficient n-octanol/water (Log Kow)	: Not applicable for gas mixtures.
Vapour pressure [20°C]	: 580 kPa
Vapour pressure [50°C]	: 13020 hPa
Density and/or relative density	: 4.8 kg/m ³
Relative vapour density (air=1)	: Heavier than air.
Particle characteristics	: Not applicable.

9.2. Other information

9.2.1. Information with regard to physical hazard classes

Explosive properties	: Not applicable.
Flammability properties	: 6.2 – 12.3 Vol-%
Oxidising properties	: Not applicable.
Critical temperature [°C]	: 94.7 °C

9.2.2. Other safety characteristics

Molar mass	: 114.04 g/mol
Evaporation rate	: Not applicable for gases and gas mixtures.
Other data	: Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

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10.3. Possibility of hazardous reactions

Can form explosive mixture with air.
May react violently with oxidants.

10.4. Conditions to avoid

Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Avoid moisture in installation systems.

10.5. Incompatible materials

Strong bases.
Air, Oxidisers.
For additional information on compatibility refer to ISO 11114.
Reactions with alkali metals. Reactions with light metals. Finely divided aluminium, Zinc, Magnesium.

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 (inhalation) : Classification criteria are not met.

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LC50 Inhalation - Rat [ppm]	405000
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Skin corrosion/irritation	: No known effects from this product.
Serious eye damage/irritation	: No known effects from this product.
Respiratory or skin sensitisation	: No known effects from this product.
Germ cell mutagenicity	: No known effects from this product.
Carcinogenicity	: No known effects from this product.
Toxic for reproduction : Fertility	: No known effects from this product.
Toxic for reproduction : unborn child	: No known effects from this product.
STOT-single exposure	: No known effects from this product.
STOT-repeated exposure	: No known effects from this product.
Aspiration hazard	: Not applicable for gases and gas mixtures.

11.2. Information on other hazards

No additional information available

SECTION 12: Ecological information

12.1. Toxicity

Assessment : Classification criteria are not met.
EC50 48h - Daphnia magna [mg/l] : > 100 mg/l

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EC50 72h - Algae [mg/l] : > 100 mg/l

LC50 96 h - Fish [mg/l] : > 197 mg/l

12.2. Persistence and degradability

Assessment : Not readily biodegradable.

12.3. Bioaccumulative potential

Assessment : Not expected to bioaccumulate due to the low log Kow (log Kow < 4).

12.4. Mobility in soil

Assessment : Because of its high volatility, the product is unlikely to cause ground or water pollution.
Partition into soil is unlikely.

12.5. Results of PBT and vPvB assessment

Assessment : Not classified as PBT or vPvB.

12.6. Endocrine disrupting properties

Assessment :

12.7. Other adverse effects

Other adverse effects : An environmental hazard cannot be excluded in the event of an unintended release.

Effect on the ozone layer : None.

Ozone depletion potential [R11=1] : 0

Global warming potential [CO2=1] : 4

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Refer to supplier's waste gas recovery programme.

Contact supplier if guidance is required.

Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with flash back arrestor.

Ensure that the emission levels from local regulations or operating permits are not exceeded.

Refer to the EIGA code of practice Doc.30 "Disposal of Gases", downloadable at

<http://www.eiga.eu> for more guidance on suitable disposal methods.

Must not be discharged to atmosphere.

Return unused product in original container to supplier.

List of hazardous waste codes (from Commission Decision 2000/532/EC as amended) : 16 05 04 *: Gases in pressure containers (including halons) containing hazardous substances.

13.2. Additional information

External treatment and disposal of waste should comply with applicable local and/or national regulations.

SECTION 14: Transport information

14.1. UN number or ID number

In accordance with ADR / RID / IMDG / IATA / ADN

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UN-No. : 3161

14.2. UN proper shipping name

Transport by road/rail/inland waterways : LIQUEFIED GAS, FLAMMABLE, N.O.S. (2,3,3,3-tetrafluoroprop-1-ene)

(ADR/RID/ADN)

Transport by air (ICAO-TI / IATA-DGR) : Liquefied gas, flammable, n.o.s. (2,3,3,3-tetrafluoroprop-1-ene)

Transport by sea (IMDG) : LIQUEFIED GAS, FLAMMABLE, N.O.S. (2,3,3,3-tetrafluoroprop-1-ene)

14.3. Transport hazard class(es)

Labelling



2.1 : Flammable gases.

Transport by road/rail/inland waterways

(ADR/RID/ADN)

Class : 2

Classification code : 2F

Hazard identification number : 23

Tunnel Restriction : B/D - Tank carriage: Passage forbidden through tunnels of category B, C, D and E. Other carriage:
Passage forbidden through tunnels of category D and E

Transport by air (ICAO-TI / IATA-DGR)

Class / Div. (Sub. risk(s)) : 2.1

Transport by sea (IMDG)

Class / Div. (Sub. risk(s)) : 2.1

Emergency Schedule (EmS) - Fire : F-D

Emergency Schedule (EmS) - Spillage : S-U

14.4. Packing group

Transport by road/rail/inland waterways : Not applicable.

(ADR/RID/ADN)

Transport by air (ICAO-TI / IATA-DGR) : Not applicable.

Transport by sea (IMDG) : Not applicable.

14.5. Environmental hazards

Transport by road/rail/inland waterways : None.

(ADR/RID/ADN)

Transport by air (ICAO-TI / IATA-DGR) : None.

Transport by sea (IMDG) : None.

14.6. Special precautions for user

Packing Instruction(s)

Transport by road/rail/inland waterways : P200.

(ADR/RID/ADN)

Transport by air (ICAO-TI / IATA-DGR)

Passenger and Cargo Aircraft : Forbidden.

Cargo Aircraft only : 200.

Transport by sea (IMDG) : P200.

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Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment.
Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.
Before transporting product containers:
- Ensure there is adequate ventilation.
- Ensure that containers are firmly secured.
- Ensure valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.

14.7. Maritime transport in bulk according to IMO instruments

Not applicable.

SECTION 15: Regulatory information

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

EU-Regulations

Restrictions on use : None.
Other information, restriction and prohibition : Ensure all national/local regulations are observed.
regulations Not listed on the PIC list (Regulation EU 649/2012).
Contains no substance(s) listed on the PIC list (Regulation EU 649/2012 concerning the export and import of hazardous chemicals).
Not listed on the POP list (Regulation EU 2019/1021).
Seveso Directive : 2012/18/EU (Seveso III) : Covered.

National regulations

No additional information available

15.2. Chemical safety assessment

A CSA has been carried out.

SECTION 16: Other information

Indication of changes : Revised safety data sheet in accordance with commission regulation (EU) No 2020/878.

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Abbreviations and acronyms

- : ATE - Acute Toxicity Estimate.
- CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008.
- REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006.
- EINECS - European Inventory of Existing Commercial Chemical Substances.
- CAS# - Chemical Abstract Service number.
- PPE - Personal Protection Equipment.
- LC50 - Lethal Concentration to 50 % of a test population.
- RMM - Risk Management Measures.
- PBT - Persistent, Bioaccumulative and Toxic.
- vPvB - Very Persistent and Very Bioaccumulative.
- STOT- SE : Specific Target Organ Toxicity - Single Exposure.
- CSA - Chemical Safety Assessment.
- EN - European Standard.
- UN - United Nations.
- ADR - Agreement concerning the International Carriage of Dangerous Goods by Road.
- IATA - International Air Transport Association.
- IMDG code - International Maritime Dangerous Goods.
- RID - Regulations concerning the International Carriage of Dangerous Goods by Rail.
- WGK - Water Hazard Class.
- STOT - RE : Specific Target Organ Toxicity - Repeated Exposure.
- : Ensure operators understand the flammability hazard.

Training advice

Full text of H- and EUH-statements	
Flam. Gas 1A	Flammable gases, Category 1A
Press. Gas (Liq.)	Gases under pressure : Liquefied gas
H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.

DISCLAIMER OF LIABILITY

- : Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.
- Details given in this document are believed to be correct at the time of going to press.
- Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

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