Safety Data Sheet

Tetrafluoroethane (R134a)

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878
Reference number: RS-C2H2F4-133
Issue date: 03/21/2015 Revision date: 09/01/2024 Supersedes: 09/01/2023 Version: 3C

Warning

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

1.1. Product identifier

Trade name	:	Tetrafluoroethane (R134a)
SDS no	:	RS-C2H2F4-133
Other means of identification	:	1,1,1,2 Tetrafluoroethane; HFC134a; Norfluran
CAS-No.	:	811-97-2
EC-No.	:	212-377-0
EC Index-No.	:	---
REACH registration No	:	01-2119459374-33
Chemical formula	:	$C_2H_2F_4$ (CH_2FCF_3)

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

Relevant identified uses	:	Industrial and professional uses. Test gas/Calibration gas. Laboratory use. Use as refrigerant. Perform risk assessment prior to use. Contact your supplier for more information on other uses.
Uses advised against	:	Consumer use. Uses other than those listed above are not supported, contact your supplier for more information on other uses.

1.3. Details of the supplier of the safety data sheet

Messer Tehnogas AD Beograd
Banjicki put , 62
RS– 11090 Belgrade, Serbia
T +381 11 35 37 200 - F +381 11 35 37 291
postoffice@messer.rs - www.messer.rs

1.4. Emergency telephone number

Emergency telephone number	:	Poison Control Center, VMA Crnotravska 17, Belgrade Serbia Tel. : +381(0) 11 360 8440 (24h)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Physical hazards	Gases under pressure : Liquefied gas	H280

2.2. Label elements

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

Hazard pictograms (CLP) :

GHS04

Signal word (CLP)	:	Warning
Hazard statements (CLP)	:	H280 - Contains gas under pressure; may explode if heated.
Precautionary statements (CLP)		
- Storage	:	P403 - Store in a well-ventilated place.
Supplemental information	:	Contains greenhouse gases listed in Annex I of EU 2024/573.

2.3. Other hazards

Contact with liquid may cause cold burns / frostbite.
Asphyxiant in high concentrations.
Not classified as PBT or vPvB.
The substance / mixture has no endocrine disrupting properties.

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
Tetrafluoroethane (R134a)	CAS no.: 811-97-2 EC no.: 212-377-0 Index no.: --- REACH no.: 01-2119459374-33	≤ 100	Press. Gas (Liq.), H280

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. Maintain an open airway. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.
- Skin contact : Carefully remove contaminated clothing. In case of frostbite spray with water for at least 15 minutes. Do not use hot water! Apply a sterile dressing. Obtain medical assistance.
- Eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove any contact lenses. Obtain medical assistance.
- Ingestion : Ingestion is not considered a potential route of exposure.

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

In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. See section 11.

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

Take first aid measures. Loosen tight clothing, such as a collar, tie or belt.
Place the unconscious person in a lateral position. Seek medical attention.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Water spray or fog. Product does not burn, use fire control measures appropriate for the surrounding fire.
- 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 : Carbon monoxide. Hydrogen fluoride. 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. 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 469 - Protective clothing for firefighters. Standard EN 659 - Protective gloves for firefighters. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	:	Act in accordance with local emergency plan. Try to stop release. Evacuate area. Ensure adequate air ventilation. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Stay upwind. See section 8 of the SDS for more information on personal protective equipment.
For emergency responders	:	Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Oxygen detectors should be used when asphyxiating gases may be released. See section 5.3 of the SDS for more information.

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	:	The product must be handled in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke while working with the product. Wash hands after use. Wear personal protective equipment (See section 8). 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 regularily) checked for leaks before use. 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.

Safe handling of the gas receptacle : Refer to supplier's container handling instructions.
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 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 the protection cap is too tight, remove it with adjustable wrench.
Never insert sharp objects into the cavities of the cap, this can lead to damage to the valve and leakage. Open valve slowly to avoid pressure shock.
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 allow backfeed into the container. Suck back of water into the container must be prevented.
Do not remove or deface labels provided by the supplier for the identification of the content of the container.

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 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.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Tetrafluoroethane (R134a) (811-97-2)	
DNEL: Derived no effect level (Workers)	
Long-term - systemic effects, inhalation	13936 mg/m³

Tetrafluoroethane (R134a) (811-97-2)	
PNEC: Predicted no effect concentration	
Aqua (freshwater)	0.1 mg/l
Aqua (marine water)	0.01 mg/l
Aquatic, intermittent releases	1 mg/l
Sediment, freshwater	0.75 mg/kg dwt
Micro-organisms in sewage treatment plant (STP)	73 mg/l

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Provide adequate general and local exhaust ventilation.
Systems under pressure should be regularly checked for leakages.
Ensure exposure is below occupational exposure limits (where available).
Oxygen detectors should be used when asphyxiating gases 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.
- 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 : 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.
  Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.
  Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask. Consult respiratory device supplier´s product information for the selection of the appropriate device.
- 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	:	-101 °C
Boiling point	:	-26.1 °C
Flammability	:	Non flammable.
Lower explosion limit	:	Not applicable.
Upper explosion limit	:	Not applicable.
Flash point	:	Not applicable for gases and gas mixtures.
Auto-ignition temperature	:	>743°C
Decomposition temperature	:	Not applicable.
pH	:	Not applicable for gases and gas mixtures.
Viscosity, kinematic	:	No reliable data available.
Water solubility [20°C]	:	1930 mg/l
Partition coefficient n-octanol/water (Log Kow)	:	0.94
Vapour pressure [20°C]	:	4.7 bar(a)
Vapour pressure [50°C]	:	13.2 bar(a)
Density and/or relative density	:	Not applicable for gases and gas mixtures.

Relative vapour density (air=1)	:	3.6
Particle characteristics	:	Not applicable for gases and gas mixtures. Nanoforms are not relevant for gases and gas mixtures.

9.2. Other information

9.2.1. Information with regard to physical hazard classes

Explosion limits	:	Not known.
Oxidising properties	:	No oxidising properties.
Critical temperature [°C]	:	101 °C

9.2.2. Other safety characteristics

Molar mass	:	102 g/mol
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.

10.3. Possibility of hazardous reactions

Under certain conditions of temperature and pressure, it can form a flammable mixture with by air.

10.4. Conditions to avoid

Avoid moisture in installation systems. (See Section 7.)

10.5. Incompatible materials

Light metals, bases and caustic products, strong oxidizing agents, fine metal powder (Al, Mg, Zn), moisture. For additional information on compatibility refer to ISO 11114.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.
During pyrolysis, CO_2, CO, fluorine, carbonyl - fluorine, and hydrogen fluoride are released.

SECTION 11: Toxicological information

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

Acute toxicity : No additional information available

Tetrafluoroethane (R134a) (811-97-2)	
LC50 Inhalation - Rat [ppm]	567000 ppm/4h

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

Other information : The substance / mixture has no endocrine disrupting properties.

SECTION 12: Ecological information

12.1. Toxicity

Assessment	:	Classification criteria are not met.
EC50 48h - Daphnia magna [mg/l]	:	980 mg/l
EC50 72h - Algae [mg/l]	:	No data available.
LC50 96 h - Fish [mg/l]	:	450 mg/l

12.2. Persistence and degradability

Assessment	:	Negligible biodegradation after 28 days.

12.3. Bioaccumulative potential

Assessment	:	See section 9. Not expected to bioaccumulate due to the low log K_{ow} (log K_{ow} < 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	:	The substance / mixture has no endocrine disrupting properties.

12.7. Other adverse effects

Other adverse effects	:	No known effects from this product.
Effect on the ozone layer	:	No effect on the ozone layer.
Global warming potential [CO_2=1] according to Annex I of EU 2024/573	:	1430
Effect on global warming	:	When discharged in large quantities may contribute to the greenhouse effect. Contains fluorinated greenhouse gases listed in Annex I of EU 2024/573.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Refer to supplier's waste gas recovery programme.
Contact supplier if guidance is required.
Discharge to atmosphere in large quantities should be avoided.
Do not discharge into any place where its accumulation could be dangerous.
Ensure that the emission levels from local regulations or operating permits are not exceeded.
Refer to the EIGA code of practice Doc.30/21 "Disposal of Gases", downloadable at http://www.eiga.eu for more guidance on suitable disposal methods.
Return unused product in original container to supplier.

List of hazardous waste codes (from Commission Decision 2000/532/EC as amended) : 14 06 01 *: Chlorofluorocarbons, HCFC, HFC.

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
UN-No. : 3159

14.2. UN proper shipping name

Transport by road/rail/inland waterways (ADR/RID/ADN)	:	1,1,1,2-TETRAFLUOROETHANE (REFRIGERANT GAS R 134A)
Transport by air (ICAO-TI / IATA-DGR)	:	Refrigerant gas R 134a
Transport by sea (IMDG)	:	1,1,1,2-TETRAFLUOROETHANE (REFRIGERANT GAS R 134a)

14.3. Transport hazard class(es)

Labelling :

2.2 : Non flammable, non-toxic gases.

Transport by road/rail/inland waterways (ADR/RID/ADN)

Class	:	2
Classification code	:	2A
Hazard identification number	:	20
Tunnel Restriction	:	C/E - Tank carriage : Passage forbidden through tunnels of category C, D and E. Other carriage : Passage forbidden through tunnels of category E

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

Class / Div. (Sub. risk(s))	:	2.2

Transport by sea (IMDG)

Class / Div. (Sub. risk(s))	:	2.2
Emergency Schedule (EmS) - Fire	:	F-C
Emergency Schedule (EmS) - Spillage	:	S-V

14.4. Packing group

Transport by road/rail/inland waterways (ADR/RID/ADN)	:	Not applicable.
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 (ADR/RID/ADN)	:	None.
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 (ADR/RID/ADN)	:	P200.
Transport by air (ICAO-TI / IATA-DGR)		
Passenger and Cargo Aircraft	:	200.
Cargo Aircraft only	:	200.
Transport by sea (IMDG)	:	P200.

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

RS Regulations

Pravilnik o ograničenjima i zabranama proizvodnje, stavljanja u promet i korišćenja hemikalija ("Sl. glasnik RS", br. 105/2013, 52/2017, 21/2019 i 29/2024)	:	None.
Pravilnik o izvozu i uvozu određenih opasnih hemikalija („Sl. glasnik RS“ br. 93/23)	:	None.
Pravilnik o Listi opasnih materija i njihovim količinama i kriterijumima za određivanje vrste dokumenta koje izrađuje operater seveso postrojenja, odnosno kompleksa ("Sl. glasnik RS", br. 41/2010, 51/2015 i 50/2018)	:	Not covered.
Other information, restriction and prohibition regulations	:	Uredba o postupanju sa flurovanim gasovima sa efektom staklene bašte, kao i uslovima za izdavanje dozvola za uvoz i izvoz takvih gasova, "Službeni glasnik RS", br. 120/2013, 44/2018

EU-Regulations

Restrictions on use	:	None.
Other information, restriction and prohibition regulations	:	Not listed on the PIC list (Regulation EU 649/2012). Not listed on the POP list (Regulation EU 2019/1021). Contains fluorinated greenhouse gases listed in Annex I of EU 2024/573.
Seveso Directive : 2012/18/EU (Seveso III)	:	Not covered.

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. In Section 2, the Safety Data Sheet is supplemented with information about label elements and other hazards. In Section 4, the Safety Data Sheet is supplemented with information about first aid measures. In Section 8, the Safety Data Sheet is supplemented with information about exposure control and personal protection. In Section 12, the Safety Data Sheet is supplemented with information about endocrine disrupting properties. In Section 13, the Safety Data Sheet is supplemented with information about waste treatment methods. In Section 15, the Safety Data Sheet is supplemented with regulatory information.
Abbreviations and acronyms	:	ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road ATE - Acute Toxicity Estimate CAS - Chemical Abstract Service number CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008 CSA - Chemical Safety Assessment DNEL - Derived No Effect Levels EINECS - European Inventory of Existing Commercial Chemical Substances EC- European Community number EIGA - European Industrial Gases Association EN - European Standard IATA - International Air Transport Association ICAO - International Civil Aviation Organization IMDG code - International Maritime Dangerous Goods IMO - International Maritime Organization LC50 - Lethal Concentration to 50 % of a test population LD50 - Lethal Dose 50% LEL - Lower Explosive Limit OEL - Occupational exposure limits PBT - Persistent, Bioaccumulative and Toxic PNEC - Predicted No Effect Concentration PPE - Personal Protection Equipment

REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
RID - Regulations concerning the International Carriage of Dangerous Goods by Rail
RMM - Risk Management Measures
STOT - RE - Specific Target Organ Toxicity - Repeated Exposure
STOT- SE - Specific Target Organ Toxicity - Single Exposure
STEL - Short Term Exposure Limit
TWA –8-hour total weight average
UEL - Upper explosive limit
UFI - Unique Formula Identifier
UN - United Nations
vPvB - Very Persistent and Very Bioaccumulative
WGK - Water Hazard Class

Training advice : Receptacle under pressure. The hazard of asphyxiation is often overlooked and must be stressed during operator training. For more guidance, refer to EIGA SL 01 “Dangers of Asphyxiation”, downloadable at http://www.eiga.eu

Further information : Classification in accordance with the procedures and calculation methods of Regulation (EC) 1272/2008 (CLP). Key literature references and sources of data are maintained in EIGA doc 169 : 'Classification and Labelling Guide', downloadable at http://www.eiga.eu

Full text of H- and EUH-statements	
H280	Contains gas under pressure; may explode if heated.
Press. Gas (Liq.)	Gases under pressure : Liquefied gas

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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