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

1.1. Product identifier

Commercial name	R134a
Our code	TR134
Chemical description	1, 1, 1, 2 – tetrafluoroethane (Norfluorane) EU Index No: ----- CAS No: 811-97-2 EC No: 212-377-0 REACH No: 01-2119459374-33-0012 Chemical formula: $C_2H_2F_4$

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

Industrial sector	Refrigeration, Air-conditioning and Automotive
Relevant identified uses	Refrigerant gas for refrigeration and air-conditioning systems
Application	Industrial and professional

1.3. Details of the supplier of the safety data sheet

MARIEL SRL
Via Olubi, 5
28013 Gattico-Veruno (NO) Italy
Telephone: +39 0322 838319
Fax: +39 0322 838813
E-mail: laboratorio@mariel.it

1.4. Emergency telephone number

Mariel Srl	**+39 0322 838319**	**Mon/Fri: 8.30-12.30 / 13.30-17.30**
CAV-CNIT Anti-Poison National Information Centre	+39 0382 24444	Hours: 24 h / 24 h

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to in Regulation (EC) No 1272/2008

Physical hazards	Liquefied Gas	H280

2.2. Label elements

Dangerous pictogram

GHS04

Signal word	Attention	
Hazard statements (H)	H280	Contains gas under pressure; may explode if heated
Precautionary statements (P)		
Storage	P410+P403	Protect from sunlight. Store in a well ventilated place.
Other information	Contains greenhouse gases disciplined by Kyoto Protocol.	

2.3. Other hazards

n.a.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name of the substance	%	EC No	CAS No	REACH No	Classification Regulation (EC) No 1272/2008 (CLP)
1,1,1,2-tetrafluoroethane	100%	212-377-0	811-97-2	01-2119459374-33-0012	Press. Gas (Liq.), H280

For more information on hazardous components, see sections 8, 11, 12 and 16.

SECTION 4: First aid measures

General information: If the person is unconscious, place it in the recovery position and get immediately medical attention. Do not give anything to an unconscious person. If breathing is irregular, give oxygen. If breathing stopped, administer artificial respiration. If symptoms persist, call a physician.

4.1. Description of first aid measures

Inhalation: Remove patience from exposure to fresh air. Administer oxygen if necessary. Obtain immediate medical attention.

Skin contact: In case of contact with skin, wash immediately with plenty of water. Remove contaminated clothing. If irritation or blistering occurs, call a physician

Eye contact: Remove contact lenses, if present. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If symptoms persist, call a physician.

Ingestion: Unlikely route of exposure. As this product is a gas, refer to the section “Inhalation”. Do not induce vomiting without medical advice. Obtain immediate medical attention.

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. In low concentrations may cause narcotic effects. Symptoms may include dizziness, headache, nausea and loss of co-ordination.

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

Do not give adrenaline-ephedrine or similar drugs group. Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media: Water spray, alcohol-resistant foam, dry chemical or CO2

Unsuitable extinguishing media: None to our knowledge.

5.2. Special hazards arising from the substance or mixture

The product is not flammable.

Specific hazards: Contents under pressure.
On heating: heating will cause a rise in pressure with a risk of bursting. Toxic and corrosive vapours are released.
Cool down the containers exposed to heat with a water spray.
Vapours are heavier than air and can cause rapid suffocation by reducing oxygen available for breathing.

5.3 Advice for firefighters

Wear self-contained positive pressure breathing apparatus (SCBA) and protective suit.
Avoid contact with skin and eyes.
Do not breathe gas/fumes/vapour.

SECTION 6: Accidental release measure

6.1. Personal precautions, protective equipment and emergency procedures

Immediately contact emergency personnel.
Immediately evacuate personnel to safe areas. Unprotected persons must be kept away.
Wear personal protective equipment refer to section 8 "Exposure controls/personal protection".

Remove all sources of ignition. Avoid contact with skin (possible frostbite).
Ventilate the area/local. In case of insufficient ventilation, wear self-contained breathing apparatus.

6.2. Environmental precautions

Do not allow product to spread into the environment.
Avoid spillage and prevent possible losses.

6.3. Methods and material for containment and cleaning up

Ventilate / aerate the area or local.

6.4. Reference to other sections

For further on personal protection, refer to section 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Technical measures	Handle and open container with care. Caution when opening, pressurized container.
	Protect from sunlight and do not expose to temperatures exceeding 50° C (122 °F).
	Do not spray on a naked flame or any incandescent material.
	Do not use in area without adequate ventilation.
	Do not pierce or burn, even after use.
	Follow the general precautions for handling, storing, and using compressed gases.
Industrial hygiene	Ensure adequate ventilation of the working area.
	Do not drink, eat or smoke in the working area.

7.2. Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers
Keep containers tightly closed in a dry, cool and well-ventilated place, away from any ignition or heat sources.
Store in original container. Protect from sunlight and do not expose to temperatures exceeding 50° C (122 °F).

7.3. Specific end use(s)

For professional and industrial use only.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

OEL (Occupational Exposure Limit): No data available.

Components	CAS No.	TLV-TWA	Parameters	Font	Year
1,1,1,2-tetrafluoroethane	811-97-2	8 h	4,240 mg/m³ 1,000 ppm	AGCIH 2005	OES (UK) 2002
		15 min.	9,740 mg/m³ 1,250 ppm	AGCIH 2005	OES (UK) 2002

DNEL			
Components	**CAS No.**	**Inhalation**	
1,1,1,2-tetrafluoroethane	811-97-2	Workers	13939 mg/m³ (long term exposure — systemic effects)
		Users	2476 mg/m³ (long term exposure — systemic effects)

PNEC			
Components	**CAS No.**	**Values**	
1,1,1,2-tetrafluoroethane	811-97-2	0,1 mg/l	Freshwater
		0,75 mg/kg dw*	Freshwater sediments
		1 mg/l 0,01 mg/l	Intermittent release
		0,01 mg/l	Marine water
		73 mg/l	Purification plant

*dry weight

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Ensure adequate ventilation. In case of insufficient ventilation, wear self-contained breathing apparatus. Wash the hands before and after using the gas. Do not smoke. Personal protective equipment must comply with EU directives: respiratory protective equipment EN 136, 140, 149; eye protection (protective goggles or safety glasses) EN 166; skin protection EN 340, 463, 468, 943-1, 943-2; hands protection (protective gloves) EN374, safety boots EN ISO 20345.

8.2.2. Individual protection measures, such as personal protective equipment

a) Eye/face protection	Safety glasses with side-shields (according to directive EN 166). If splashes, goggles or face shield.
b) Skin protection	
i) Hand protection	Protective gloves resistant to chemical products (EN374). The penetration time of the gloves must be greater than the period of expected use. Gloves should be replaced immediately if they show signs of wear or deterioration.
ii) Other	Wear safety shoes while handling containers. Apron or protective clothing are not necessary.
c) Respiratory protection	In case of insufficient ventilation, wear self-contained breathing apparatus. (EN133). Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

8.2.3. Environmental exposure controls

Handling in accordance with good industrial hygiene and safety practice.
Avoid leakage or spillage in the environmental. Avoid dispersion in the air.
For more information, see section 13.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

a)	**Physical state:**	Gas
b)	**Colour:**	Colourless
c)	**Odour:**	Ethereal
d)	**Melting point/freezing point:**	- 103,3 °C
e)	**Boiling point or initial boiling point and boiling range:**	- 25,9 °C @ 1.013 kPa
f)	**Flammability:**	No flammable gas
g)	**Lower and upper explosion point:**	Absent
h)	**Flash point:**	Not applicable to gases and gas mixtures
i)	**Auto-ignition temperature:**	> 750 °C
j)	**Decomposition temperature:**	370 °C
k)	**pH:**	Not applicable to gases and gas mixtures
l)	**Kinematic viscosity:**	Not applicable to gases and gas mixtures
m)	**Solubility** (in water):	0,15% weight
n)	**Partition coefficient n-octanol/water (log value):**	1,06 log Pow @ 25 °C
o)	**Vapour pressure:**	6,654 bar @ 25 °C 13,18 bar @ 50 °C
p)	**Density and/or relative density;**	Not applicable to gases and gas mixtures
q)	**Relative vapour density:**	3.6 gas (air=1)
r)	**Particle characteristics:**	Not applicable to gases and gas mixtures

9.2. Other information

Molecular mass	102,03 g/mol
Critical temperature	101,6 °C
Critical pressure	40,59 bar
Critical density	511,9 kg/m^3

SECTION 10: Stability and reactivity

10.1. Reactivity

Stable under normal handling and storage conditions.

10.2. Chemical stability

Stable under normal handling and storage conditions.

10.3. Possibility of hazardous reactions

This product is non-reactive under normal handling and storage conditions.

10.4. Conditions to avoid

Contains under pressure, may explode if heated.
Protect from sunlight and do not expose to temperatures exceeding 50 °C.
Keep away from heat, sparks, open flame or other sources of ignition. Do not smoke.
Do not pierce or burn, even after use.
Do not spray on a naked flame or any incandescent material.

10.5. Incompatible materials

No reaction with common materials in dry or wet conditions.
Avoid contact with alkaline and caustic products, alkaline-earth metals (e.g. calcium, aluminium powder, zinc and magnesium), powdered metals and oxidizing agents.

10.6. Hazardous decomposition products

No hazardous decomposition under normal conditions.
In case of fire, for thermal decomposition, the following substances can be released: halogen acids, carbon oxides (CO, CO2), fluorocarbons, carbonyl halides.

SECTION 11: Toxicological information

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

a) acute toxicity	
Inhalation	LC50: > 500 000 ppm Exposure time: 4 h Animal species: Rat
b) skin corrosion/irritation	Based on available data the classification criteria are not met.
c) serious eye damage/irritation	Based on available data the classification criteria are not met.
d) respiratory or skin sensitisation	LC50: > 500 000 ppm Exposure time: 4 h Animal species: Rat
e) germ cell mutagenicity	
in vitro genotoxicity	In vitro test: Ames Result: Negative
in vivo genotoxicity	Based on available data the classification criteria are not met.
f) carcinogenicity	Based on available data the classification criteria are not met.
g) reproductive toxicity	Based on available data the classification criteria are not met.
h) STOT-single exposure	Based on available data the classification criteria are not met.
i) STOT-repeated exposure	Inhalation (experimental result, support study) NOAEL: ≥ 50000 ppm Animal species: Rat
j) aspiration hazard	Based on available data the classification criteria are not met.

11.2. Information on other hazards

Cardiac sensitization	NOAEC: 40 000 ppm LOAEC: 80 000 ppm Animal species: Dog

SECTION 12: Ecological information

12.1. Toxicity

Fish	LC50: 450 mg/l Exposition time: 96 h Species: Oncorhynchus mykiss (Rainbow trout)
Aquatic invertebrates	EC50: 980 mg/l Exposition time: 48 h Species: Daphnia magna (Water flea)
Algae	EC50: > 118 mg/l Exposition time: 72 h Species: Selenastrum capricornutum (Fresh water algae)

12.2. Persistence and degradability

Water: 3% biodegradation after 28 days
Air: Medium life 9.7 years

12.3. Bioaccumulative potential

Log Pow 1.06

12.4. Mobility in soil

Log Koc 1.50

12.5. Results of PBT and vPvB assessment

This product does not meet the PBT or vPvB criteria.

12.6. Endocrine disrupting properties

n.a.

12.7. Other adverse effects

Ozone Depletion Potential	ODP (R-11=1) = 0
Global Warming Potential	GWP (CO2=1) = 1.430

SECTION 13: Disposal consideration

13.1. Waste treatment methods

Product	Take all necessary measures to prevent the production of residuals, value the possible methods of regeneration or recycling. Dispose in accordance with local, state, and federal regulations. Do not discharge into drains or environment.
Packaging	Reuse and recycle the packaging after its reclaim. Dispose of non-reusable packaging in accordance with local, state, and federal regulations.

European Waste Code (EWC)

Product 14 06 01* Chlorofluorocarbons, HCFC, HFC.
Packaging 15 01 11* Metallic packaging containing a hazardous solid porous matrix (for example asbestos), including empty pressure containers.

SECTION 14: Transport information

14.1. UN number or ID number

ADR-RID-ADN-IMDG-ICAO UN 3159

14.2. UN proper shipping name

ADR-RID-ADN-IMDG-ICAO 1,1,1,2–tetrafluoroethane

14.3. Transport hazard class(es)

ADR-RID-ADN: 2
IMDG-ICAO: 2.2

Label: 2.2

Additional information

Tunnel restriction code (ADR)	C/E
EmS (IMDG)	F-C, S-V

14.4. Packing group

ADR-RID-ADN-IMDG-ICAO	n.a.

14.5. Environmental hazards

Dangerous for the environmental	NO
Maritime pollution	NO

14.6. Special precautions for user

The transport, including loading and unloading, must be carried out by persons who have received appropriate training concerning required by the modal regulations.
Road transport must be carried out by vehicles authorized for the transport of dangerous goods in accordance with the requirements of the current edition of the ADR Agreement and the applicable national provisions. 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.
Ensure that containers are firmly secured.
Ensure there is adequate ventilation.

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

Ozone Depletion Potential	ODP (R-11=1) = 0
Global Warming Potential	GWP (CO2=1) = 1.430

Additional regulations/legislations

Regulation (EU) No 517/2014.
Directive Seveso-III 96/82/EC: Not included.

15.2. Chemical safety assessment

A Chemical Safety Assessment (CSA) has been made for this product.

SECTION 16: Other information

This Material Safety Data Sheet has been made in compliance with the European Directive in force.

Text of hazard (H) and precautionary (P) statements in section 2 and 3

H220	Extremely flammable gas
H280	Contains gas under pressure; may explode if heated
P210	Keep away from heat, sparks, open flames, hot surfaces – No smoking.
P377	Leaking gas fire – do not extinguish unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.
P403	Store in a well-ventilated place

Text of "Hazard Class and Category Code" in section 2 and 3, according to Regulation (EC) No 1272/2008

Press. Gas (Liq.) Pressurized gas : Liquefied gas

History	Version 6 by Mariel Srl Revision date: 07/2021	Version 5 Date: 01/2019	Version 4 Date: 09/2018	Version 3 Date: 10/2015	Version 2 Date: 02/2014	Version 1 Date: 01/2011

b) Abbreviations and acronyms

ADN	Agreement Dangerous goods by inland waterways
ADR	Accord Dangerous Route

CAS	Chemical Abstracts Service number
CE / EC	European Community
CLP	Classification, Labelling, Packaging
CSA	Chemical Safety Assessment
DNEL	Derived No-Effect Level
EC50	Effective Concentration 50%
EIGA	European Industrial Gases Association
EmS	Emergency Schedule
EWC	European Waste Code
GHS	Globally Harmonised System
GWP	Global Warming Potential
HCFC	Hydro-Chloro-Fluoro-Carbons
HFC	Hydro-Fluoro-Carbons
ICAO	International Civil Aviation Organization
IMDG	International Maritime Dangerous Goods code
LC50	Lethal Concentration 50%
LOAEC	Lowest Observed Adverse Effect Concentration
Log Koc	Logarithm Partition coefficient Soil/water
Log Pow (Kow)	Logarithm Partition coefficient n-Octanol/water
n.a.	not applicable
NOAEC	No Observed Adverse Concentration Level
NOAEL	No Observed Adverse Effect Level
ODP	Ozone Depleting Potential
OEL	Occupational Exposure Limit
PBT	Persistent Bio-accumulative Toxic
PNEC	Predicted No Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RID	Rail International Dangerous goods transport
STOT-RE	Specific Target Effect Concentration-repeated exposure
STOT-SE	Specific Target Effect Concentration-single exposure
TLV	Threshold Limit Value
TWA	Time Weighted Average
UE / EU	European Union
vPvB	very Persistent very Bioaccumulative

Notice of liability

This information should not constitute a guarantee for any specific product properties. This information are only a guidance for safe handling, use, processing, storage, transportation, disposal and release and are not to be considered a warranty or a quality specification.

The information contained in this safety data sheet are based on our current knowledge and EU and national laws; they describe the product only with regard to safety requirements. The conditions of the user are beyond our knowledge and control. The product should not be used for purpose other than those specified. It is always the responsibility of the user to take all the necessary measures to comply with the requirements of current legislation. The information contained in this form should not considered as a guarantee of its properties.