SAFETY DATA SHEET

In compliance with EC Regulations No.: 1907/2006, 830/2015 and 1272/2008 (CLP).

Date last modified: 15 April 2021 - Version 2.0

1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY

1.1 Product Identifier

Product Name: REFRIGERANT R407F
Product Code #: 330292

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

Relevant identified uses: Refrigerant.
Industrial and professional uses only. Perform risk assessment prior to use.

Uses advised against: This product is not recommended for any industrial, professional or consumer use other than the Intended Uses above and the instructions written in this Safety Data Sheet.

1.3 Details of the supplier of the safety data sheet

Company/undertaking identification

Supplier/Manufacturer:

Marichem Marigases Hellas SA
Sfaktirias 64,
185 45 Piraeus,
Greece
Tel. No.: ++30 210 4148800
Fax No.: ++30 210 4133985
http://www.marichem-marigases.com

e-mail: mail@marichem-marigases.com

1.4 Emergency telephone number

Tel. No.: ++30 210 4148800 (including working hours)

Emergency Information:
Inside U.S. and Canada: (800)-424-9300 (CHEMTREC)
Outside U.S. and Canada: 1-703-527-3887 (CHEMTREC)
National Emergency Centre (Greece): ++30 210 7793777

2. HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

Hazard Class and Category Code Regulation EC 1272/2008 (CLP/GHS)

Physical hazards

Gases under pressure, Liquefied gas.

H280: Contains gas under pressure; may explode if heated.

Adverse physicochemical, human health and environmental effects

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Contact with the liquid may cause frostbite and serious damage to eyes.

2.2. Label elements

Labelling Regulation EC 1272/2008 (CLP)

Hazard pictograms:

GHS04

Signal word: Warning

Hazard Statements

H280 - Contains gas under pressure; may explode if heated.

Precautionary statements

Storage

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

Supplemental label information

Greenhouse fluorinated gas falling within Kyoto Protocol (GWP=1825).

2.3. Other hazards

No additional information available.

3. COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Chemical Composition:

Ingredients	CAS Number	Concentration (%)	Hazard Code(s)*
Difluoromethane (HFC-32)	75–10–5	30 %	H221; H280
Pentafluoroethane (HFC 125)	354–33–6	30 %	H280
1,1,1,2-Tetrafluoroethane (HFC 134a)	811–97–2	40 %	H280

*See section 16 for the full text of the Hazard Code(s) declared above.

Occupational Exposure Limits, if available, are listed in section 8.

4. FIRST AID MEASURES

4.1. Description of first aid measures

Inhalation
Move the affected person away from the contaminated area and into the fresh air. If you feel unwell, seek medical advice.

Skin contact
In the event of contact with the liquid: treat resulting frostbite as a burn. Immediately remove contaminated clothing or footwear. Immediately rinse with plenty of water. If skin burns appear, call a doctor immediately.

Eye contact
Rinse immediately and thoroughly, pulling the eyelids well away from the eye (15 minutes minimum). Consult an eye specialist immediately.

Ingestion
Not specifically applicable (gas).

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

Symptoms
CNS depression. Narcosis. Cardiac disorders. Lack of oxygen: risk of death.

4.3. Indication of any immediate medical attention and special treatment needed
No additional information available.

5. FIRE FIGHTING MEASURES

5.1. Extinguishing media
Suitable extinguishing media: All extinguishing agents can be used.
Unsuitable extinguishing media: None to our knowledge. If there is a fire close by, use suitable extinguishing agents.

5.2. Special hazards arising from the substance or mixture
Explosion hazard: pressure rise and possible bursting of container.

On heating : Toxic and corrosive vapours are released.

5.3. Advice for fire-fighters
Firefighting instructions: Use water spray or fog for cooling exposed containers.

Protection during firefighting: Self-contained breathing apparatus. Complete protective clothing.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures
General measures:
Avoid contact with skin and eyes. Remove all sources of ignition. Do not smoke. Evacuate the danger area. Do not breathe smoke. Stop the leak.

Emergency procedures: Evacuate area.

6.2. Environmental precautions
No additional information available.

6.3. Methods and materials for containment and cleaning up
Other information: Mechanically ventilate the spillage area.

6.4. Reference to other sections
For disposal instructions see section 13.

7. HANDLING AND STORAGE

7.1. Precautions for safe handling
Avoid breathing mist, vapours. Do not get in eyes, on skin, or on clothing. Ventilation.
Vapours are heavier than air and may spread along floors. Under certain temperature and pressure conditions may form a flammable mixture in the presence of air.

Hygiene measures: Do not drink, eat or smoke in the workplace.

7.2. Conditions for safe storage, including any incompatibilities
Storage conditions : Store : in a cool, well-ventilated area, away from any source of heat, away from any source of ignition.

Incompatible materials: Strong oxidizing agents. Alkaline hydroxide. Alkaline earth metals. Finely divided metals (Al, Mg, Zn).
Packaging materials : Recommended materials Stainless steel, Carbon steel. Do not use : Alloys containing more than 2% magnesium, Plastic materials.

7.3. Specific end use(s)
No additional information available.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1. Control parameters

8.1.1. National occupational exposure and biological limit values.

Pentafluoroethane (354-33-6)
EU - Indicative Occupational Exposure Limit (IOEL)

IOEL TWA	4900 mg/m³ (recommended)
IOEL TWA [ppm]	1000 ppm (recommended)

Difluoromethane (75-10-5)
EU - Indicative Occupational Exposure Limit (IOEL)

IOEL TWA	2200 (recommended)
IOEL TWA [ppm]	1000 ppm (recommended)

1,1,1,2-Tetrafluoroethane (811-97-2)
United Kingdom - Occupational Exposure Limits

Local name	1,1,1,2-Tetrafluoroethane (HFC 134a)
WEL TWA (OEL TWA) [1]	4240 mg/m³
WEL TWA (OEL TWA) [2]	1000 ppm
Regulatory reference	EH40. HSE

8.1.2. Recommended monitoring procedures
No additional information available

8.1.3. Air contaminants formed
No additional information available

8.1.4. DNEL and PNEC

Pentafluoroethane (354-33-6)
DNEL/DMEL (Workers)

Long-term - systemic effects, inhalation	16444 mg/m³

DNEL/DMEL (General population)

Long-term - systemic effects, inhalation	1753 mg/m³

PNEC (Water)

PNEC aqua (freshwater)	0.1 mg/l
PNEC aqua (intermittent, freshwater)	1 mg/l

PNEC (Sediment)

PNEC sediment (freshwater)	0.6 mg/kg dwt

8.1.5. Control banding
No additional information available

8.2 Exposure Controls

8.2.1. Appropriate engineering controls
No additional information available

8.2.2. Personal protection equipment

8.2.2.1. Eye and face protection
Eye protection: Safety glasses with side shields

8.2.2.2. Skin protection
Skin and body protection: Majority cotton protective clothing

Hand protection: Leather protective gloves. Nitrile-rubber protective gloves. VITON gloves

8.2.2.3. Respiratory protection
Respiratory protection: In the event of insufficient ventilation: Gas mask with filter type AX. In a confined area: Self-contained breathing apparatus

8.2.2.4. Thermal hazards
No additional information available

8.2.3. Environmental exposure controls
No additional information available

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical state :	Gas
Appearance :	Liquefied gas.
Colour :	Colourless.
Odour :	slightly ethereal.
Odour threshold :	No data available
pH :	Not applicable
Relative evaporation rate (butylacetate=1) :	No data available
Melting point :	No data available
Freezing point :	No data available
Boiling point :	-45.5 °C
Flash point :	Not applicable
Critical temperature :	86.05 °C
Auto-ignition temperature :	No data available
Decomposition temperature :	No data available
Flammability (solid, gas) :	Non flammable.
Vapour pressure :	11.4 bar (20°C)
Vapour pressure at 50 °C :	24.3 bar (50°C)
Relative vapour density at 20 °C :	No data available
Relative density :	No data available
Density :	1.139 g/cm³ (20°C)
Solubility :	Insoluble in water.
Partition coefficient n-octanol/water (Log Pow) :	No data available
Viscosity, kinematic :	No data available
Viscosity, dynamic :	No data available
Explosive properties :	Not explosive material according to EC criteria.
Oxidising properties :	Non oxidizing material according to EC criteria.
Explosive limits :	No data available

9.2. Other information

No additional information available.

10. STABILITY AND REACTIVITY

10.1. Reactivity
Decomposes on exposure to temperature rise.

10.2. Chemical stability
Stable at ambient temperature and under normal conditions of use.

10.3. Possibility of hazardous reactions
No information available. No polymerization.

10.4. Conditions to avoid
Avoid high temperatures. Avoid naked flame. Heating will cause a rise in pressure with a risk of bursting.

10.5. Incompatible materials
Alkalis and caustic products. Alkali metals. Alkaline earth metals.
Finely divided metals (Al, Mg, Zn). Strong oxidizing agents

10.6. Hazardous decomposition products
On thermal decomposition (pyrolysis), releases : Hydrogen fluoride, Carbon oxides (CO, CO2), Fluorinated hydrocarbons, Carbonyl halogenides.

11. TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Acute toxicity (oral) :	Not classified
Acute toxicity (dermal) :	Not classified
Acute toxicity (inhalation) :	Not classified

Pentafluoroethane (354-33-6)

LC50 Inhalation - Rat [ppm]	800000 ppm/4h

Difluoromethane (75-10-5)

LC50 Inhalation - Rat [ppm]	> 520000 ppm/4h

1,1,1,2-Tetrafluoroethane (811-97-2)

LC50 Inhalation - Rat [ppm]	> 500000 ppm/4h

Skin corrosion/irritation :	Not classified pH: Not applicable
Additional information :	Contact with the liquid causes frostbite
Serious eye damage/irritation :	Not classified pH: Not applicable
Additional information :	Contact with the liquefied gas may cause severe ocular lesions
Respiratory or skin sensitisation :	Not classified
Germ cell mutagenicity :	Not classified
Carcinogenicity :	Not classified

1,1,1,2-Tetrafluoroethane (811-97-2)

NOAEL (chronic, oral, animal/male, 2 years)	300 mg/kg bodyweight rat
Reproductive toxicity :	Not classified
STOT-single exposure :	Not classified
STOT-repeated exposure :	Not classified

Difluoromethane (75-10-5)

NOAEC (inhalation, rat, gas, 90 days)	50000 ppmv/6h/day
Aspiration hazard :	Not classified

12. ECOLOGICAL INFORMATION

Hazardous to the aquatic environment, short-term (acute):	Not classified
Hazardous to the aquatic environment, long-term (chronic):	Not classified

Pentafluoroethane (354-33-6)

LC50 - Fish [1]	> 100 mg/l 96 Hours (Oncorhynchus mykiss)
EC50 - Crustacea [1]	> 100 mg/l 48 Hours (Daphnia magna)
EC50 72h - Algae [1]	> 114 mg/l 72 Hours (Pseudokirchneriella subcapitata)

1,1,1,2-Tetrafluoroethane (811-97-2)

LC50 - Fish [1]	450 mg/l 96 Hours (Oncorhynchus mykiss)
EC50 - Crustacea [1]	980 mg/l 48 Hours (Daphnia magna)
EC50 72h - Algae [1]	> 118 mg/l (Selenastrum capricornutum)

12.2. Persistence and degradability

Pentafluoroethane (354-33-6)

Persistence and degradability	5 % biodegradation after 28 days.

1,1,1,2-Tetrafluoroethane (811-97-2)

Persistence and degradability	Photodegradation in the air : Half-life in air : 9,7 y. 3 % biodegradation after 28 days.

12.3. Bioaccumulative potential

Pentafluoroethane (354-33-6)

Partition coefficient n-octanol/water (Log Pow)	1.48

Difluoromethane (75-10-5)

Partition coefficient n-octanol/water (Log Pow)	0.21

1,1,1,2-Tetrafluoroethane (811-97-2)

Partition coefficient n-octanol/water (Log Pow)	1.06

12.4. Mobility in soil

Pentafluoroethane (354-33-6)

Partition coefficient n-octanol/water (Log Koc)	1.3 – 1.7

1,1,1,2-Tetrafluoroethane (811-97-2)

Partition coefficient n-octanol/water (Log Koc)	1.5

12.5. Results of PBT and vPvB assessment

PBT and vPvB assessment

1,1,1,2-Tetrafluoroethane (811-97-2)
This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

Pentafluoroethane (354-33-6)
This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

12.6. Other adverse effects

Global Warming Potential

Ozone depletion factor ODP (R-11=1) = 0.
Total global warming potential (GWP) : 1774.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product/Packaging disposal recommendations :
Methods of disposal of packaging. Reuse or recycle following decontamination. Destroy at an authorised site.

Additional information :
The user's attention is drawn to the possible existence of specific european, national or local regulations regarding disposal.

14. TRANSPORT INFORMATION

In accordance with ADR / IMDG / IATA / RID

ADR	IMDG	IATA	RID
14.1. UN number			
UN 3163	**UN 3163**	**UN 3163**	**UN 3163**
14.2. UN proper shipping name			
LIQUEFIED GAS, N.O.S. (1,1,1,2-Tetrafluoroethane ; Pentafluoroethane ; Difluoromethane)	LIQUEFIED GAS, N.O.S. (1,1,1,2-Tetrafluoroethane ; Pentafluoroethane ; Difluoromethane)	Liquefied gas, n.o.s. (1,1,1,2-Tetrafluoroethane ; Pentafluoroethane ; Difluoromethane)	LIQUEFIED GAS, N.O.S. (1,1,1,2-Tetrafluoroethane ; Pentafluoroethane ; Difluoromethane)
Transport document description			
UN 3163 LIQUEFIED GAS, N.O.S. (1,1,1,2-Tetrafluoroethane ; Pentafluoroethane ; Difluoromethane), 2.2, (C/E)	UN 3163 LIQUEFIED GAS, N.O.S. (1,1,1,2-Tetrafluoroethane ; Pentafluoroethane ; Difluoromethane), 2.2	UN 3163 Liquefied gas, n.o.s. (1,1,1,2-Tetrafluoroethane ; Pentafluoroethane ; Difluoromethane), 2.2	UN 3163 LIQUEFIED GAS, N.O.S. (1,1,1,2-Tetrafluoroethane ; Pentafluoroethane ; Difluoromethane), 2.2

ADR	IMDG	IATA	RID
14.3. Transport hazard class(es)			
2.2	2.2	2.2	2.2
			
14.4. Packing group			
Not applicable	Not applicable	Not applicable	Not applicable
14.5. Environmental hazards			
Dangerous for the environment: No	Dangerous for the environment: No Marine pollutant: No	Dangerous for the environment: No	Dangerous for the environment: No
No supplementary information available			

14.6. Special precautions for user

Overland transport

Classification code (ADR) : 2A
Special provisions (ADR) : 274, 660, 662
Limited quantities (ADR) : 120ml
Tank code (ADR) : PxBN(M)
Transport category (ADR) : 3
Hazard identification number (Kemler No.) : 20
Orange plates : 20 / 3163
Tunnel restriction code (ADR) : C/E
EAC code : 2TE

Transport by sea

Special provisions (IMDG) : 274
Limited quantities (IMDG) : 120 ml
EmS-No. (Fire) : F-C
EmS-No. (Spillage) : S-V

Air transport

PCA Limited quantities (IATA) : Forbidden
PCA limited quantity max net quantity (IATA) : Forbidden
PCA packing instructions (IATA) : 200
PCA max net quantity (IATA) : 75kg
CAO packing instructions (IATA) : 200
CAO max net quantity (IATA) : 150kg

Rail transport

Classification code (RID) : 2A
Special provisions (RID) : 274, 660, 662
Limited quantities (RID) : 120ml
Tank codes for RID tanks (RID) : PxBN(M)
Transport category (RID) : 3
Colis express (express parcels) (RID) : CE3
Hazard identification number (RID) : 20

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable

15. REGULATORY INFORMATION

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

15.1.1. EU-Regulations

Contains no REACH substances with Annex XVII restrictions
Contains no substance on the REACH candidate list
Contains no REACH Annex XIV substances
Contains no substance subject to Regulation (EU) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of hazardous chemicals.
Contains no substance subject to Regulation (EU) No 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants
Other information, restriction and prohibition regulations: * Regulation (EC) No 517/2014 : Greenhouse fluorinated gas falling within Kyoto Protocol.

15.1.2. National regulations

Ensure all national/local regulations are observed.

15.2 Chemical safety assessment

No additional information available

16. OTHER INFORMATION

16.1 Full text of Hazard Code(s) referred in Section 3.

H221: flammable gas.
H280: Contains gas under pressure; may explode if heated.

16.2 Abbreviations and acronyms

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road).
RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail).
IMDG: International Maritime Code for Dangerous Goods.
IATA: International Air Transport Association.
ICAO: International Civil Aviation Organization.
bw: Body weight.
Carc.: Carcinogenicity.
CAS number: Chemical Abstracts Service number.
CLP: Classification Labelling Packaging Regulation.
CSA: Chemical Safety Assessment.
CSR: Chemical Safety Report.
DNEL: Derived No Effect Level.
dw: Dry weight.
EC number: EINECS and ELINCS number.
EC: European Commission.
EC50: Half maximal effective concentration.
EINECS: European Inventory of Existing Commercial Chemical Substances.
ELINCS: European List of Notified Chemical Substances.
EmS: Emergency Schedule.
ERC: Environmental Release Category.

ES: Exposure scenario.
food: oral feed.
GHS: Globally Harmonized System of Classification and Labelling of Chemicals.
Irrit.: Irritation.
LC50: Lethal concentration, 50 %.
LD50: Median Lethal dose.
LOAEC: Lowest Observed Adverse Effect Concentration.
LOAEL: Lowest Observed Adverse Effect Level.
MK value: Maximum Concentration value.
NCO: An international corporation that provides customer service contracting.
NOAEC: No Observed Adverse Effect Concentration.
NOAEL: No Observed Adverse Effect Level.
NOEC: No Observed Effect Concentration.
OECD: Organisation for Economic Cooperation and Development.
PBT: Persistent, Bioaccumulative and Toxic.
PNEC: Predicted No Effect Concentration.
PROC: Process category.
REACH: The Registration, Evaluation, Authorisation and Restriction of Chemicals.
Resp.: Respiratory.
Sens.: Sensitization.
STEL value: Short Term Exposure Limit value.
STOT RE: Specific target organ toxicity — repeated exposure.
STOT SE: Specific target organ toxicity — single exposure.
STOT: Specific Target Organ Toxicity.
STP: Sewage Treatment Plant.
SU: Sector of use.
Tox.: Toxicity.
TWA value: Time Weighted Average value.
vPvB: Very Persistent and Very Bioaccumulative.

16.3 Notice to reader

All information, instructions and statements contained in this Material Safety Data Sheet are compiled in accordance with European Directives, corresponding national legislation and on the basis of information given by our suppliers.
The information disclosed in this Material Safety Data Sheet (which supersedes all previous versions) is believed to be correct, at the date of issue, to the best of our current knowledge and experience. It only relates to the specific product designated herein and it may not be valid when said product is used in combination with any other products or in any processed form, unless specified in the text. This document aims to provide the necessary health and safety information of the product and is not to be considered a warranty or quality specification. It is the responsibility of the recipient of this Material Safety Data Sheet to ensure that information given here is read and understood by all who use, handle, dispose of or in any way come in contact with the product.
Also, it is the responsibility of the user to comply with local legislation relating to safety, health, environment and waste management. Data and information provided concerning the product are informative, exclusively presented to the customer.