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

1.1. Product identifier

R454B (DuPont™ Opteon® XL41)
Refrigerant mixture HFC-HFO (Difluoromethane, 2,3,3,3- Tetrafluoropropene)
(CH ₂ F ₂ , C ₃ H ₂ F ₄)

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

Relevant identified uses	Industrial and professional
	Test gas/Calibration gas
	Use for manufacture of electronic/photovoltaic components
	Use as refrigerant
	Laboratory use
	Contact supplier for more information on uses
Uses advised against	Consumer use not recommended

1.3. Details of the supplier of the safety data sheet

	MULTIGAS
Company identification	Route de l'Industrie 102
	CH-1564 Domdidier
Dhama anns ha s	
Phone number	+41 (0) 26 676 94 94
E-mail address	info@multigas.ch

1.4. Emergency telephone numbers

145 (Toxicology Centre Zurich) or +41 (0) 44 251 51 51 +41 (0) 26 676 94 94 (Multigas)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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



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Gases under pressure : Liquefied gas For the complete H-sentences texts mentioned in that chapter, refer to Section 16

2.2. Label elements

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

Hazard pictograms

		GHS02 GHS04
Signal word		Danger
Hazard statements		
	H221	Flammable gas
	H280	Contains gas under pressure; may explode if heated
Precautionary statem	ients	
	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
	P410+P403	Protect from sunlight. Store in a well-ventilated place

2.3. Other hazards

None

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	Concentration	Classification
Difluoromethane (R32)	(CAS-No.) 75-10-5 (EC-No.) 200-839-4 (EC Index-No.) (Registration-No.) 01-2119471312-47	67.9 – 69.9 %	Flam. Gas 1B, H221 Press. Gas (Liq.), H280
2,3,3,3-Tetrafluoropropene (R1234yf)	(CAS-No.) 754-12-1 (EC-No.) 468-710-7 (EC Index-No.) (Registration-No.) 01-0000019665-61	30.1 – 32.1 %	Flam. Gas 1B, H221 Press. Gas (Liq.), H280

For the complete H-sentences texts mentioned in that chapter, refer to Section 16 Contains no other components or impurities which will influence the classification of the product



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3.2. Mixtures

Not established

SECTION 4: First aid measures

4.1. Description of first aid measuresGeneral adviceSee a doctor. Show this safety data sheet to the attending physicianIn case of inhalationIn case of inhalation, remove the person from the contaminated area. In
case of respiratory arrest, give artificial respiration. See a doctorIn case of skin contactFrostbite should be treated like thermal burns: Immediate, abundant and
prolonged washing with water. Consult a doctorIn case of eyes contactImmediate washing, abundant and prolonged with water. If irritation
persists, consult a doctorIn case of ingestionDo NOT induce vomiting. Never give anything by mouth to an unconscious
person. Rinse mouth with water. See a doctor

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

May cause asphyxiation at high concentrations. Symptoms may include loss of consciousness or motor skills. The victim may not be aware of the asphyxia Refer to section 11

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

Do not give adrenaline or similar drugs

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	Water spray or water mist. Dry powder. Carbon dioxide. Foam
Unsuitable extinguishing media	Do not use water jet

5.2. Special hazards arising from the substance or mixture

Specific hazards	In case of fire or excessive heat, hazardous combustion products may be produced Exposure to fire may cause containers to rupture/explode
Hazardous combustion products	In case of fire or excessive heat, hazardous combustion products may be produced such as : carbonyl fluoride, carbon monoxide, hydrogen fluoride

5.3. Additional information

Cool endangered receptacles with water spray jet from a protected position



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SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid breathing vapours, spray mists or gases Provide adequate ventilation Evacuate personnel to a safe place Personal protective equipment, see section 8

6.2. Environmental precautions

6.3. Methods and material for containment and cleaning up

Ventilate the area

6.4. Reference to other sections

See also sections 8 and 13

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Avoid contact with skin and eyes Avoid breathing vapours or mist Keep away from sources of ignition - No smoking Take measures to avoid the accumulation of electrostatic charges For precautions, see section 2.2

7.2. Conditions for safe storage, including any incompatibilities

Store in a cool place. Keep container tightly closed in a dry and wellventilated place Storage life: > 10 years Recommended storage temperature: < 52 °C Content under pressure

7.3. Specific end use(s)

None



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SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Components with occupational exposure limits

Component	CAS N°	Exposure value type	Control parameter	Source
		TWA	-	
Difluoromethane	75 10 5	IVVA	-	No limit value of
(R32)	75-10-5 OEL		-	exposure to workstations
		UEL	-	
		TWA	-	
2,3,3,3-Tetrafluoropropene	754-12-1	IWA	-	No limit value of
(R1234yf)	R1234yf)	(1234yf)	-	exposure to workstations
		OEL	-	

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Provide adequate general and local exhaust ventilation Gas detectors should be used when flammable / toxic gases / vapours are likely to be released

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

Eye/face protection	Wear goggles and a face shield when transfilling or breaking transfer connections. Standard EN 166
Skin / hand protection	Wear protective gloves when handling gas cylinders Standard EN 388- Protective gloves against mechanical hazards
	The selected protective gloves have to satisfy the specifications of EU Directive 89/686 / EEC and the standard EN 374 derived from it
	For short-term use
	Material: Fluoroelastomer
	Penetration time:> 480 min
	Glove thickness: 0.7 mm
	For long-term use
	Material: Fluoroelastomer
	Penetration time:> 480 min
	Glove thickness: 0.7 mm
	Have appropriate, chemical-resistant protective clothing ready for use in emergencies
Respiratory protection	Self-contained breathing apparatus (SCBA) or positive pressure air mask must be used in oxygenated atmospheres. Standard EN 137 - Self- contained compressed air device with a full face mask



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8.2.3. Environmental exposure controls

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	No data available
Odour threshold	No data available
pH	No data available
Melting point / Freezing point	No data available
Boiling point	-50.9°C
Flash point	No data available
Evaporation rate	No data available
Flammability (solid, gas)	No data available
Explosive limits	11.25 - 22 %
Vapour pressure [20°C]	13.9 bar
Vapour pressure [50°C]	29.3 bar
Vapour density	No data available
Relative density, liquid (water=1)	1
Relative density, gas (air=1)	2.2
Water solubility	No data available
Partition coefficient n-octanol/water (Log Kow)	No data available
Auto-ignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available
9.2. Other information	
Molar mass	62.6 g/mol
Critical temperature [°C]	77°C
Relative vapour density	Gas/vapour heavier than air. May acc particularly at or below ground level

Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level



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SECTION 10: Stability and reactivi	ity	
10.1. Reactivity		
10.2. Chemical stability	No reactivity hazard other than the effects des	scribed in sub-sections below
	Stable under recommended storage condition	IS
10.3. Possibility of hazardous reaction	ions	
	May react violently with oxidants	
	May form an explosive mixture with air	
10.4. Conditions to avoid		
	Keep away from heat and sources of ignition and red metal surfaces. Do not smoke	n. Avoid contact with flames
10.5. Incompatible materials		
	Air, oxidizers, finely divided metal powders, st	rong oxidizers
	For more information on compatibility, refer to	ISO 11114
10.6. Hazardous decomposition pro	ducts	
	Under normal conditions of storage and use products should not be produced	e, hazardous decomposition

SECTION 11: Toxicological information

11.1. Chemical safety assessment

Acute toxicity	No toxicological effects expected with this product if exposure limit values are not exceeded
Skin corrosion/irritation	No data available
Serious eye damage/irritation	No data available
Respiratory or skin sensitisation	No data available
Germ cell mutagenicity	No data available
Carcinogenicity	No data available
Reproductive toxicity	No data available
STOT-single exposure – Target organ(s)	No data available
STOT-repeated exposure	No data available
Ingestion hazard	No data available



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SECTION 12: Ecological information

12.1. Toxicity

Assessment

The classification criteria are not met

12.2. Persistence and degradability

Hardly biodegradable

12.3. Bioaccumulative potential

Virtually non-bioaccumulative

12.4. Mobility in soil

No data available

12.5. Results of PBT and vPvB assessment

 PBT / vPvB assessment is not available because the chemical safety assessment is not required / is not conducted

12.6. Other adverse effects

Contains fluorinated greenhouse gases When discharged in large quantities may contribute to the greenhouse effect

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product	Must not be released into the atmosphere		
	Burn in a chemical incinerator equipped with an afterburner and scrubber		
	Return to the supplier the product not consumed in its original container		
Contaminated container	Eliminate as unused product		
	Contact the supplier if instructions are needed		
OMoD Code	14 06 01		
	Solvent, refrigerant and aerosol propellant or organic foam wastes: Chlorofluorocarbons, HCFCs, HFCs		

SECTION 14: Transport information

14.1. UN number

Transport par road/rail	Transport by sea	Transport by air
ADR / RID	IMDG	IATA
3161	3161	3161



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14.2. UN proper shipping name

Transport par road/rail ADR / RID	Transport by sea IMDG	Transport by air IATA
LIQUEFIED GAS, FLAMMABLE, N.O.S.	LIQUEFIED GAS, FLAMMABLE, N.O.S.	LIQUEFIED GAS, FLAMMABLE, N.O.S.
(Difluoromethane,	(Difluoromethane,	(Difluoromethane,
2,3,3,3-Tetrafluoropropene) R454B	2,3,3,3-Tetrafluoropropene) R454B	2,3,3,3-Tetrafluoropropene) R454B

14.3. Transport hazard class(es)

Labelling				
ADR/RID IMDG IATA	2.1 Flammable gases			
14.4. <u>Packing group</u> ADR/RID IMDG IATA	Not established			
14.5. Environmental hazards				
ADR/RID	None			
IMDG	None			
ICAO-TI / IATA-DGR	None			
14.6. Special precautions for user				
	No data available			
14.7. Transport in bulk according to Annex II of Marpol and the IBC Code				
	Not applicable			
SECTION 15: Regulatory information				

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

This safety data sheet complies with the requirements of Regulation (CE) No. 1907/2006

15.2. Chemical safety assessment

A CSA has not been made yet



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SECTION 16: Other information			
Indication of changes	Revised safety data sheet in accordance with commission regulation (EU)		
	No 2015/830		
Abbreviations and acronyms	ADR :	European Agreement concerning the International Carriage of Dangerous Goods by Road	
	CAS :	Chemical Abstract Service number (USA)	
	CLP :	Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008	
	CSA :	Chemical Safety Assessment	
	EIGA :	European Industrial Gases Association	
	EINECS :	European Inventory of Existing Commercial Chemical Substances	
	EN :	European Standard	
	ATE :	Acute Toxicity Estimate	
	IATA :	International Air Transport Association	
	IMDG Code :	International Maritime Dangerous Goods Code	
	LC50 :	Lethal Concentration to 50 % of a test population	
	OMoD :	Swiss Ordinance on the movement of waste	
	PBT :	Persistent, Bioaccumulative and Toxic	
	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-SE :	Specific Target Organ Toxicity - Single Exposure	
	UN :	United Nations	
	vPvB :	Very Persistent and Very Bioaccumulative	
	WGK:	Water Hazards Class	

Full text of H, EUH and P statements used in sections 2 and 3

Hazard statementsH221Flammable gasH280Contains gas under pressure; may explode if heatedPrecautionary statementsP210Keep away from heat/sparks/open flames/hot surfaces. — No smokingP377Leaking gas fire: Do not extinguish, unless leak can be stopped safelyP381Eliminate all ignition sources if safe to do soP410+P403Protect from sunlight. Store in a well-ventilated place



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Disclaimer of liability

Details given in this document have been prepared based on the most available reliable documents and are believed to be correct at the time of going to press

They do not claim to be exhaustive and should be considered as a guide