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

1.1 Product identifier

Trade name

R 1224yd

Substance name	(Z)-1-Chloro-2,3,3,3-tetrafluoropropene
REACH registration no.	01-2120816930-57

Identification numbers

CAS no.	111512-60-8
EC no.	813-937-2

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

Relevant identified uses of the substance or mixture
Refrigerant
Solvent
Bloating agent

Uses advised against
All other uses

1.3 Details of the supplier of the safety data sheet

Address
TEGA - Technische Gase und Gasetechnik GmbH
Werner-von-Siemens-Straße 18
97076 Würzburg

Telephone no.	+49 931 2093-220
Fax no.	+49 931 2093-180
e-mail	kaeltemittel@tega.de

Advice on Safety Data Sheet
sdb_info@umco.de

Austrian sales partner:

Address
TEGA Austria GmbH
Steyrer Str. 62
3350 Haag
Tel.: +43 7434 42851

1.4 Emergency telephone number

For medical advice (in German and English):
+49 (0)551 192 40 (Giftinformationszentrum Nord)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification in accordance with Regulation (EC) No 1272/2008 (CLP)
Press. Gas liq.; H280
STOT SE 3; H336

Classification information
This product is assessed and classified using the methods and criteria below referred to in Article 9 of Regulation (EC) n° 1272/2008:
Physical hazards: determined through assessment data based on the methods or standards referred to in part 2 of Annex I to CLP
Health hazards and environmental hazards: determined through toxicological and ecotoxicological assessment data based on the methods or standards referred to in Part 3 and 4 of Annex I to CLP.

2.2 Label elements

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

Product identifier
111512-60-8 ((Z)-1-Chloro-2,3,3,3-tetrafluoropropene)

Hazard pictograms

GHS04

GHS07

Signal word
Warning

Hazard statement(s)

H280	Contains gas under pressure; may explode if heated.
H336	May cause drowsiness or dizziness.

Precautionary statement(s)

P261	Avoid breathing gas.
P271	Use only outdoors or in a well-ventilated area.
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P312	Call a POISON CENTER/doctor if you feel unwell.
P410+P403	Protect from sunlight. Store in a well-ventilated place.
P501	Dispose of contents/container to a facility in accordance with local/regional/national/international regulations.

2.3 Other hazards

EIGA-As: asphyxiating gas in high concentrations; Contact with the liquid can cause cold burns or frostbite. This product does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

PBT assessment
The product is not considered to be a PBT.

vPvB assessment
The product is not considered to be a vPvB.

SECTION 3: Composition/information on ingredients

3.1 Substances

Chemical characterization

Substance name	(Z)-1-Chloro-2,3,3,3-tetrafluoropropene
Formula	C3HClF4
Molecular weight	148,49

Identification numbers

CAS no.	111512-60-8
EC no.	813-937-2

3.2 Mixtures

Not applicable. The product is not a mixture.

SECTION 4: First aid measures

4.1 Description of first aid measures

General information
In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Remove affected person from danger area, lay him down. Seek medical advice immediately.

After inhalation

Remove affected persons from dangerous area by observing suitable respiratory protection measures. Ensure supply of fresh air. Irregular breathing/no breathing: artificial respiration. Call a doctor immediately.

After skin contact
In case of contact with skin wash off immediately with soap and water. Rinse with much water in case of frostbites. Remove chlothes only after unfreezing. Cover wounds with sterile dressing. Call a doctor immediately.

After eye contact
Remove contact lenses. Rinse eye thoroughly under running water keeping eyelids wide open and protecting the unaffected eye (at least 10 to 15 minutes). Seek medical assistance.

After ingestion
Rinse the mouth thoroughly with water. Do not induce vomiting. Never give anything by mouth to an unconscious person.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms
The following symptoms may occur: respiratory arrest. Shortness of breath; Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling. May be fatal if inhaled.

4.3 Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Extinguishing measures to suit surroundings.

Unsuitable extinguishing media
High power water jet

5.2 Special hazards arising from the substance or mixture

In the event of fire, the following can be released: Carbon monoxide and carbon dioxide; Hydrogen fluoride (HF); carbonyl halides; May explode if exposed to heat. Liquefied gas: Spilled liquid can cause cold burns. This gas is heavier than air and may accumulate in low areas. The product is not flammable.

5.3 Advice for firefighters

Use self-contained breathing apparatus. Wear full protective suit. Containers close to fire should be transferred to a safe place. Cool closed containers exposed to fire with water. Pressure increase, bursting and explosion hazard during heating. Fire residues and contaminated firefighting water must be disposed of in accordance with the local regulations.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel
Refer to protective measures listed in sections 7 and 8. Provide good room ventilation even at ground level (vapours are heavier than air). Do not breathe gas. Keep away from ignition sources. Use personal protective clothing. Cordon and mark contaminated area. Remove persons to safety.

For emergency responders
Personal protective equipment (PPE) - see section 8.

6.2 Environmental precautions

Avoid release in the environment. Suppress gases/vapours/mists with water spray jet.

6.3 Methods and material for containment and cleaning up

Ensure adequate ventilation. Dispose of absorbed material in accordance with the regulations.

6.4 Reference to other sections

Information regarding safe handling, see section 7. Information regarding personal protective measures, see section 8. Information regarding waste disposal, see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Only qualified and trained persons are authorised to handle. Provide good ventilation at the work area (local exhaust ventilation, if necessary). To be used only according to instructions for use. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose containers heat or sources of ignition. In case of accidental release: danger due to low temperature of the liquid product. The product should only be used in areas from which all naked lights and other sources of ignition have been excluded. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use. Comply with the health and safety at work laws.

General protective and hygiene measures
Wash hands before breaks and after work. Do not inhale gases. Do not eat, drink or smoke during work time. Keep away from foodstuffs and beverages. Have emergency shower available.

Advice on protection against fire and explosion
The product is not combustible. Isolate from sources of heat, sparks and open flame. Take precautionary measures against electrostatic loading (earthing necessary during loading operations). Electrical equipment should be protected to the appropriate standard.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures and storage conditions
Keep container tightly closed in a cool, well-ventilated place, open and handle carefully. Protect from heat and direct sunlight.

Recommended storage temperature

Value	<	50	°C

Requirements for storage rooms and vessels
Containers which are opened must be carefully closed and kept upright to prevent leakage. Always keep in containers of same material as the original.

Incompatible products
Substances to be avoided, see section 10.

Stoarge Class according TRGS 510

2A	Gases (except aerosol dispensers and lighters)

7.3 Specific end use(s)
No data available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

DNEL, DMEL and PNEC values

DNEL values (worker)

No	Substance name			CAS / EC no	
	Route of exposure	Exposure time	Effect	Value	
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**			**111512-60-8 813-937-2**	
	inhalative	Long term (chronic)	systemic	1260	mg/m³
	inhalative	Short term (acut)	systemic	69365	mg/m³

DNEL value (consumer)

No	Substance name			CAS / EC no	
	Route of exposure	Exposure time	Effect	Value	
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**			**111512-60-8 813-937-2**	
	inhalative	Long term (chronic)	systemic	224	mg/m³

	inhalative	Short term (acut)	systemic	51765	mg/m³

PNEC values

No	Substance name		CAS / EC no	
	ecological compartment	Type	Value	
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**		**111512-60-8 813-937-2**	
	water	fresh water	4,87	µg/L
	water	marine water	0,487	µg/L
	water	fresh water sediment	75,9	µg/kg dry weight
	water	marine water sediment	76	µg/kg dry weight
	soil	-	12	µg/kg dry weight

8.2 Exposure controls

Appropriate engineering controls
Ensure adequate ventilation, local exhaust at the work station if necessary. If these are not sufficient to maintain concentrations of particulates and solvent vapour below the OEL, suitable respiratory protection must be worn.

Personal protective equipment

Respiratory protection
Self-contained breathing apparatus. In case of insufficient ventilation or long-term effect use breathing apparatus. Danger of suffocation due to high concentrations in breathing air.

Eye / face protection
Tightly fitting safety glasses (EN 166).

Hand protection
Low-temperature-resistant gloves (EN 511). Sufficient protection is given wearing suitable protective gloves checked according to i.e. EN 374, in the event of risk of skin contact with the product. Before use, the protective gloves should be tested in any case for its specific work-station suitability (i.e. mechanical resistance, product compatibility and antistatic properties). Adhere to the manufacturer's instructions and information relating to the use, storage, care and replacement of protective gloves. Protective gloves shall be replaced immediately when physically damaged or worn. Design operations thus to avoid permanent use of protective gloves.
Appropriate Material Leather

Other
Chemical-resistant work clothes. Protective shoes.

Environmental exposure controls
Information regarding waste disposal, see chapter 13.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

State of aggregation
gas

Form
liquified gas

Colour
colourless

Odour
ethereal

pH value
Not applicable

Boiling point / boiling range

Value		15	°C
Reference pressure		1013	hPa
Source	ECHA		

Melting point/freezing point			
Value		-115,2	°C
Method	OECD 102		
Source	ECHA		

Decomposition temperature
no data available

Flash point
Not applicable

Ignition temperature
No data available

Auto-ignition temperature			
Value		543	°C
Method	A 15		
Source	supplier		

Oxidising properties
No data available.

Explosive properties
No data available

Flammability	
The product is non-flammable.	
Method	EN 1839:2009 (method T)
Source	supplier

Lower explosion limit			
Value		16	%
Source	supplier		

Upper explosion limit			
Value		19	%
Source	supplier		

Vapour pressure			
Value		151	kPa
Reference temperature		25	°C
Source	supplier		

Relative vapour density	
Value	5,2
Source	supplier
Comments	Air = 1

Relative density			
Value		1,362	
Reference temperature		25	°C
Reference substance	liquid substance		
Source	supplier		
Comments	Water=1		

Density
No data available

Solubility in water			
Value		540	mg/L

Reference temperature	20	°C
Source	supplier	

Solubility
No data available

Partition coefficient n-octanol/water (log value)			
No	**Substance name**	**CAS no.**	**EC no.**
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**	**111512-60-8**	**813-937-2**

log Pow		2,1	
Reference temperature		25	°C
Method	OECD 121		
Source	ECHA		

Kinematic viscosity			
Value	0,261	mPa*s	
Reference temperature	25	°C	
Type	dynamic		
Source	supplier		

Particle characteristics
No data available

9.2 Other information

Other information
No data available.

SECTION 10: Stability and reactivity

10.1 Reactivity
Dangerous reactions are not expected if the product is handled according to its intended use. For the avoidance of thermal reaction does not overheat.

10.2 Chemical stability
Stable under recommended storage and handling conditions (See section 7).

10.3 Possibility of hazardous reactions
Stable under recommended storage and handling conditions (See section 7).

10.4 Conditions to avoid
Temperatures > 50°C. Heat, naked flames and other ignition sources.

10.5 Incompatible materials
Alkali metals; Earth alkali metals

10.6 Hazardous decomposition products
None, if handled according to intended use. In case of fire: see section 5.

SECTION 11: Toxicological information

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

Acute oral toxicity
No data available

Acute dermal toxicity
No data available

Acute inhalational toxicity			
No	**Substance name**	**CAS no.**	**EC no.**
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**	**111512-60-8**	**813-937-2**

LC50	>	20180	ppmV
Duration of exposure		4	h

State of aggregation	Gas
Species	rat
Method	OECD 436
Source	ECHA

Skin corrosion/irritation
No data available

Serious eye damage/irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity			
No	**Substance name**	**CAS no.**	**EC no.**
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**	**111512-60-8**	**813-937-2**

Type of examination	in vitro gene mutation study in bacteria
Species	S. typhimurium TA 1535, TA 1537, TA 98, TA 100 and E. coli WP2
Method	OECD 471
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.

Reproduction toxicity			
No	**Substance name**	**CAS no.**	**EC no.**
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**	**111512-60-8**	**813-937-2**

Route of exposure	inhalational
Type of examination	Reproduction/Developmental Toxicity Screening Test
Species	rat
Method	OECD 421
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.

Carcinogenicity
No data available

STOT - single exposure			
No	**Substance name**	**CAS no.**	**EC no.**
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**	**111512-60-8**	**813-937-2**

Route of exposure	inhalational		
NOEC	>	40335	ppm
Duration of exposure		4	week/s
Species	rat		
Method	OECD 412		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		

STOT - repeated exposure			
No	**Substance name**	**CAS no.**	**EC no.**
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**	**111512-60-8**	**813-937-2**

Route of exposure	inhalational		
NOAEC		10320	ppm
Duration of exposure		13	week/s
Species	rat		
Method	OECD 413		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		

Aspiration hazard
No data available

11.2 Information on other hazards

Endocrine disrupting properties
No data available.

Other information
No data available.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish (acute)				
No	**Substance name**	**CAS no.**		**EC no.**
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**	**111512-60-8**		**813-937-2**
LC50		101		mg/l
Duration of exposure		96		h
Species	Oryzias latipes			
Method	OECD 203			
Source	ECHA			

Toxicity to fish (chronic)
No data available

Toxicity to Daphnia (acute)				
No	**Substance name**	**CAS no.**		**EC no.**
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**	**111512-60-8**		**813-937-2**
EC50		18,9		mg/l
Duration of exposure		48		h
Species	Daphnia magna			
Method	OECD 202			
Source	ECHA			

Toxicity to Daphnia (chronic)
No data available

Toxicity to algae (acute)				
No	**Substance name**	**CAS no.**		**EC no.**
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**	**111512-60-8**		**813-937-2**
EC50	>	4,87		mg/l
Duration of exposure		72		h
Species	Raphidocelis subcapitata			
Method	OECD 201			
Source	ECHA			

Toxicity to algae (chronic)
No data available

Bacteria toxicity
No data available

12.2 Persistence and degradability

Biodegradability				
No	**Substance name**	**CAS no.**		**EC no.**
1	**(Z)-1-Chloro-2,3,3,3-tetrafluoropropene**	**111512-60-8**		**813-937-2**
Type	aerobic biodegradation			
Value		0		%
Duration		28		day(s)
Method	OECD 301 D			
Source	ECHA			
Evaluation	not degradable			

12.3 Bioaccumulative potential

Partition coefficient n-octanol/water (log value)

No	Substance name	CAS no.	EC no.
1	(Z)-1-Chloro-2,3,3,3-tetrafluoropropene	111512-60-8	813-937-2

log Pow	2,1	
Reference temperature	25	°C
Method	OECD 121	
Source	ECHA	

12.4 Mobility in soil
No data available.

12.5 Results of PBT and vPvB assessment

Results of PBT and vPvB assessment	
PBT assessment	The product is not considered to be a PBT.
vPvB assessment	The product is not considered to be a vPvB.

12.6 Endocrine disrupting properties
No data available.

12.7 Other adverse effects
No data available.

12.8 Other information

Other information
Do not discharge product unmonitored into the environment.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
dispose of in accordance with local regulation.
Allocation of a waste code number, according to the European Waste Catalogue, should be carried out in agreement with the regional waste disposal company.

Packaging
Dispose of in accordance with federal, state and local regulations. Disposal should be observed in conformity with the Regional Waste Disposal Authority.

SECTION 14: Transport information

14.1 Transport ADR/RID/ADN

Class	2
Classification code	2A
Hazard identification no.	20
UN number	UN3163
Proper shipping name	LIQUEFIED GAS, N.O.S.
Technical name	(Z)-1-Chloro-2,3,3,3-tetrafluoropropene
Tunnel restriction code	C/E
Label	2.2 (RID: +13)

14.2 Transport IMDG

Class	2.2
UN number	UN3163
Proper shipping name	LIQUEFIED GAS, N.O.S.
Technical name	(Z)-1-Chloro-2,3,3,3-tetrafluoropropene
EmS	F-C, S-V
Label	2.2

14.3 Transport ICAO-TI / IATA

Class	2.2
UN number	UN3163
Proper shipping name	Liquefied gas, n.o.s.

Technical name	(Z)-1-Chloro-2,3,3,3-tetrafluoropropene
Label	2.2

14.4 Other information
No data available.

14.5 Environmental hazards
Information on environmental hazards, if relevant, please see 14.1 - 14.3.

14.6 Special precautions for user
To be transported always in closed, upright and safe containers. Make sure that persons handling these containers are aware of the rules of conduct in case of incident or spillage.

14.7 Maritime transport in bulk according to IMO instruments
Not relevant

SECTION 15: Regulatory information

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

EU regulations

Regulation (EC) No 1907/2006 (REACH) Annex XIV (List of substances subject to authorisation)
In accordance with the REACH regulation (EC) 1907/2006, the product does not contain any substances that are considered as subject to listing in annex XIV, inventory of substances requiring authorisation.

REACH candidate list of substances of very high concern (SVHC) for authorisation
In accordance with article 57 and article 59 of the Reach regulation (EC) 1907/2006, this substance is not considered as subject to listing in annex XIV, inventory of substances requiring authorisation ("Authorization list").

Regulation (EC) No 1907/2006 (REACH) Annex XVII: RESTRICTIONS ON THE MANUFACTURE, PLACING ON THE MARKET AND USE OF CERTAIN DANGEROUS SUBSTANCES, MIXTURES AND ARTICLES
The substance is not subject to the provisions of annex XVII (restriction entries) of the Reach regulation (EC) 1907/2006.

Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances
This substance is not subject to Part 1 or 2 of Annex I

Other regulations
Adhere to the national sanitary and occupational safety regulations when using this product.

National regulations

Water Hazard Class (Germany)

Class	1
Source	Classification according to AwSV (Regulation on facilities for handling substances that are hazardous to water).

Other regulations
To be considered: "Technische Regel Druckbehälter" TRB 610; Take into account: TRGS 510 "Storage of hazardous substances in non-stationary containers"

15.2 Chemical safety assessment
A chemical safety assessment has been carried out for this substance.

SECTION 16: Other information

Sources of key data used to compile the data sheet:
Regulation (EC) No 1907/2006 (REACH), 1272/2008 (CLP) as amended in each case.
Directives 2000/39/EC, 2006/15/EC, 2009/161/EU, (EU) 2017/164.
National Threshold Limit Values of the corresponding countries as amended in each case.
Transport regulations according to ADR, RID, IMDG, IATA as amended in each case.
The data sources used to determine physical, toxic and ecotoxic data, are indicated directly in the corresponding section.

Creation of the safety data sheet
UMCO GmbH

This information is based on our present knowledge and experience.
The safety data sheet describes products with a view to safety requirements.
It does not however, constitute a guarantee for any specific product properties and shall not establish a legally valid contractual relationship.

Prod-ID 798488