AURORA

ANALYSIS CERTIFICATE

DATE: AUG. 27, 2014

TO: WHOM IT MAY CONCERN

DESCRIPTION OF GOODS: REFRIGERANT 134A

PACKING: IN 13.6KGS CYLINDER

INV. NO: FHGS140730

TEST ITEMS	**Specification**	**Analysis Results**
Inspection Standard	GB/T 18826-2002	
Appearance	Clear, Colorless and Odorless	Clear, Colorless and Odorless
Purity, % by weight	≥99.9	99.9
Moisture, % by weight	≤0.001	0.0007
Acidity (as in HCL), % by weight	≤0.0001	undetected
Residue on Evaporation, % by weight	≤0.01	0.0005
Non-condensable Gas, % by volume	≤1.5	0.4
Chlorides, % by volume	Pass	Pass

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Material Safety Data Sheet

HFC-134a

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: HFC-134a
DISTRIBUTOR: **Aurora Chemicals Sdn Bhd**
No.3, Jalan Meranti Jaya 14,
Meranti Jaya Industrial Park,
47100 Puchong, Selangor.
Tel: 603-8062 3110 Fax:603-80623118
Email: aurora11@streamyx.com

2. COMPOSITION / INFORMATION ON INGREDIENTS

INGREDIENTS NAME	CAS NUMBER	WEIGHT
1,1,1,2-Tetrafluoroethane	811-97-2	100%

Trace impurities and additional material names not listed above also appear in Section 15 toward the end of the MSDS.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Colorless, volatile liquid with ethereal and faint sweetish odor. Non-flammable material. Overexposure may cause dizziness and loss of concentration. At higher level, CNS depression and cardiac arrhythmia may result from exposure. Vapors displace air and can cause asphyxiation in confined spaces. At higher temperatures, (>250°C), decomposition products may include Hydrofluoric Acid (HF) and carbonyl halides.

POTENTIAL HEALTH HAZARDS

Skin: Irritation would result from defatting action tissue. Liquid contact could cause frostbite.

Eyes: Liquid contact can cause severe irritation and frostbite. Mist may irritate.

Inhalation: HFC-134a is low in acute toxicity in animals. When oxygen levels in air are reduced to 12-14% by displacement, symptoms of asphyxiation, loss of coordination, increased pulse rate and deeper respiration will occur. At high levels, cardiac arrhythmia may occur.

Ingestion: Ingestion is unlikely because of the low boiling point of the material. Should it occur, discomfort in the gastrointestinal tract from rapid evaporation of the material and consequent evolution of gas would result. Some effects of inhalation and skin exposure would be expected.

Delayed Effects: None Known.

Ingredients found on one of the OSHA designated carcinogen lists are listed below.

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INGREDIENTS NAME	NTP STATUS	IARC STATUS	OSHA LIST
No ingredients listed in this section			

4. FIRST AID MEASURES

Skin: Promptly flush skin with water until all chemical is removed. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with clean, soft cloth or similar covering. Get medical attention if symptoms persist.

Eyes: Immediately flush eyes with large amounts of water for at least 15minutes, (in case of frostbite, water should be lukewarm, not hot) lifting eyelids occasionally to facilitate irrigation. Get medical attention if symptoms persist.

Inhalation: Immediately remove patient to fresh air. If breathing has stopped, give artificial respiration. Use oxygen as required provided a qualified operator is available. Get medical attention immediately. DO NOT give epinephrine (adrenaline).

Ingestion: Ingestion is unlikely because of the physical properties and is not expected to be hazardous. Do NOT induce vomiting unless instructed to do so by a physician.

Advice To Physician: Because of the possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, should be used with special caution and only in situations of emergency life support. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

Flash Point:	Gas, not applicable per DOT regulations
Flash Point Method:	Not applicable
Auto ignition Temperature:	> 750°C
Upper Flame Limit (volume% in air):	None*
Lower Flame Limit (Volume% in air):	None* (Based on ASHRAE Standard 34 with match ignition)
Flame Propagation Rate (solids):	Not applicable
OSHA Flammability Class:	Not applicable

EXTINGUISHING MEDIA: Use any standard agent -choose the one most appropriate for type of surrounding fire (material itself is not flammable)

UNUSUAL FIRE AND EXPLOSION HAZARDS:
HFC-134a is not flammable at ambient temperatures and atmospheric pressure. However, this material will become combustible when mixed with air under pressure and exposed to strong ignitions sources. Contact with certain reactive metals may result in formation of explosive or exothermic reactions under specific conditions (e.g. very high temperatures and/or appropriate pressures).

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SPECIAL FIRE FIGHTING PRECAUTIONS / INSTRUCTIONS:
Firefighters should wear self-contained, NIOSH-approved breathing apparatus for protection against suffocation and possible toxic decomposition products. Proper eye and skin protection should be provided. Use water spray to keep fire exposed containers cool.

6. ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE: (Always wear recommended personal protective equipment)
Evacuate unprotected personnel. Protected personnel should remove ignition sources and shut off leak, if without risk, and provide ventilation. Unprotected personnel should not return until air has been tested and determined safe, including low-lying areas.

Spills and releases may have to be reported to Federal and/or local authorities. See section 15 regarding reporting requirements.

7. HANDLING AND STORAGE

NORMAL HANDLING: (Always wear recommended personal protective equipment)
Avoid breathing vapors and liquid contact with eyes, skin or clothing. Do not puncture or drop cylinders, expose them to open flame or excessive heat. Use authorized cylinders only. Follow standard safety precautions for handling and use of compressed gas cylinders.

HFC-134a should not be mixed with air above atmospheric pressure for leak testing or any other purpose.

STORAGE RECOMMENDATIONS:
Store in a cool, well ventilated area of low fire risk and out of direct sunlight. Protect cylinder and its fittings from physical damage. Storage in subsurface locations should be avoided. Close valve tightly after use when empty.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:
Provide local ventilation at filling zones and areas where leakage is probable. Mechanical (general) ventilation may be adequate for other operating and storage areas.

PERSONAL PROTECTIVE EQUIPMENT

Skin Protection:
Skin contact with refrigerant may cause frostbite. General work clothing and gloves (leather) should provide adequate protection. If prolonged contact with liquid or gas is anticipated, insulated gloves constructed of PVA, neoprene or butyl rubber should be used. Any contaminated clothing should be promptly removed and washed before reuse.

Eye Protection:
For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear chemical safety goggles.

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Respiratory Protection:
None generally required for adequately ventilated work situations. For accidental release or non-ventilated situations, or release into confined space, where the concentration may be above the PEL of 1,000 ppm, use a self-contained, NIOSH approved breathing apparatus or supplied air respirator. For escape : Use the former or a NIOSH approved gas mask with organic vapor canister.

Additional Recommendations:
Where contact with liquid is likely, such as in spill or leak, impervious boots and clothing should be worn. High dose-level warning signs are recommended for areas of principle exposure. Provide eyewash stations and quick-drench shower facilities at convenient locations. For tank operations, see OSHA regulations. 29 CFR 1910.132 and 29 CFR 1910.133.

EXPOSURE GUIDELINES

NAME	ACGIH TLV	OSHA PEL	OTHER LIMIT
1,1,1,2-Tetrafluoroethane	None	None	1000ppm TWA (8hr)

* = Workplace Environmental Exposure Level (AIHA)
** = Biological Exposure Index (ACGIH)

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Clear, colorless liquid and vapor
PHYSICAL:	Gas at ambient temperatures
MOLECULAR WEIGHT:	102
CHEMICAL FORMULA:	$F^3 CCH_2 F$
ODOR:	Faint ethereal odor
SPECIFIC GRAVITY (water = 1.0):	< 1.22
SOLUBILITY IN WATER (weight %)	0.15wt%
pH:	Neutral
BOILING POINT:	-26.2°C (-15.1°F)
FREEZING POINT:	-92.5°C (-141.9°F)
VAPOR PRESSURE:	85.8 psia @ 70°F 213.4 psia @ 130°F
VAPOR DENSITY (air= 1.0):	3.5
EVAPORATION RATE:	>1 **COMPARED TO:** CCl_4 =1
% VOLATILES:	100
FLASH POINT	Not applicable

(Flash point method and addition flammability data are found in section 5.

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HFC-134A

10. STABILITY AND REACTIVITY

NORMALLY STABLE? (CONDITIONS TO AVOID):

The product is stable.
Do not mix with oxygen or air above atmospheric pressure. Any source of high temperatures, such as lighted cigarettes, flames, hot spots or welding may yield toxic and/or corrosive decomposition products.

INCOMPATIBILITIES:
(Under specific conditions: e.g. very high temperatures and/or appropriate pressures) - Freshly abraded aluminum surfaces (may cause strong exothermic reaction). Chemically reactive metals: potassium, calcium, powdered aluminum, magnesium, and zinc.

HAZARDOUS DECOMPOSITION PRODUCTS:
Halogens, halogen acids and possibly carbonyl halides.

HAZARDOUS POLYMERIZATION:
Will not occur.

11. TOXICOLOGICAL INFORMATION

IMMEDIATE (ACUTE) EFFECTS:
LC_{50} : 4 hr (rat)-≥ 500,000 ppm / cardiac sensitization threshold (dog) - 80,000 ppm. NOEL – 50,000ppm

DELAYED (SUBCHRONIC AND CHRONIC)
Not mutagenic in four tests
Teratogenic NOEL (rat and rabbit) - 40,000ppm
Subchronic inhalation (rat) NOEL - 50,000ppm
Chronic NOEL - 10,000ppm

OTHER DATA:
Metabolism < 0.5% as CO_2 in tests at 50,000ppm, late developing benign tumors were found.

12. ECOLOGICAL INFORMATION

Degradability (BOD): HFC-134a is a gas at room temperature; therefore, it is unlikely to remain in water.
Octanol Water Partition Coefficient: Log P_{ow} = 1.06

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13. DISPOSAL CONSIDERATIONS

RCRA

Is the unused product a RCRA hazardous waste if discarded? Not a hazardous waste
If yes, the RCRA ID number is: Not applicable

OTHER DISPOSAL CONSIDERATIONS:
Disposal must comply with the federal state and local disposal or discharge laws. HCFC-22 is subject to the Environment Protection Agency Clean Air Act regarding refrigerant recycling.

The information offered here is for the product as shipped. Use and or alterations to the product such as mixing with other materials may significantly change the characteristic of the material and alter the RCRA classification and the proper disposal method.

14. TRANSPORT INFORMATION

DOT HAZARD CLASS: DOT PROPER SHIPPING NAME: Chrolodifluoromethane
DOT HAZARD CLASS: 2.2
DOT PACKING GROUP: Not applicable

DOT ID NUMBER: UN3159

For additional information on shipping regulations affecting this material, contact the information number found in section 1.

15. REGULATORY INFORMATION

TOXIC SUBTANCES CONTROL ACT (TSCA)
TSCA INVENTORY STATUS: Listed on the TSCA inventory
OTHER TSCA ISSUES: None

SARA TITLE III / CERLA
"Reportable Quantities" (RQs) and or :Threshold Planning Quantities" (TPQs) exist for the following ingredient.

INGREDIENT NAME	SARA / CERLA RQ (lb.)	SARA EHS TPQ (lb.)

No ingredients listed in this section

Spills or release resulting in the loss of any ingredient at or above its RQ requires immediate notification to your Local Emergency Planning Committee.

SECTION 311 HAZARDS CLASS: IMMEDIATE
PRESSURE

SARA 313 TOXIC CHEMICALS:
The following ingredients are SARA 313 "Toxic Chemicals", CAS numbers and weight percents are found in section 2.

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INGREDIENT NAME	COMMENT
No Ingredients listed in this section	None

STATE RIGHT-TO-KNOW
In addition to the ingredients found in section 2, the following are listed for state right-to-know purposes.

INGREDIENTS NAME	WEIGHT%	COMMENT
No ingredients listed in this section.		

16. OTHER INFORMATION

CURRENT ISSUE DATE: October 2005

OTHER INFORMATION: HMIS classification : Health-1, Flammability-1, Reactivity-0
NFPA classification: Health-2, Flammability-1, Reactivity-0
ANSI / ASHRAE 34 Safety Group- A1 UL Classified

Regulatory Standards:
1. OSHA regulation for compressed gases: 29 CFR 1910.101
2. DOT classification per 49 CFR 172.101

Toxicity information per PAFT Testing

17. DISCLAIMER

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CERTIFICATE OF ANALYSIS

FRESCO 134a

Packing/Sample	13.6 kgs / can
Batch No./ Lot No.	GB/T18826-2016
Container No	
Country of Origin	CHINA
Report Date	02.07.2020

Characteristics	Unit	Specifications	Analytical Result
Purity	%	≥ 99.80	99.92
Residue on Evaporation	%	≤ 0.01	0.005
Acid Contents (as HCl)	ppm	≤ 1.0	< 0.0001
Acid Contents (as HCl)	ppm	≤ 1.0	NONE
Moisture	ppm	≤ 10	6.6

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SAFETY DATA SHEET
RISALAH DATA KESELAMATAN

FRESCO R134A

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION
PENGENALPASTIAN PRODUK KIMIA DAN SYARIKAT

Product name ***Nama Produk***	R134a *R134a*
Synonyms ***Sinonim***	HFC 134a; 1,1,1,2-tetrafluoroethane
Chemical Formula ***Formula Kimia***	CH_2 –F-CH_3
CAS No ***Nombor CAS***	811-97-2
Use of Substance ***Penggunaan Bahan***	Industrial uses as refrigerant, blowing agent, propellant and solvent. *Sebagai agen pendingin, ejen bertiup, propelan dan pelarut..*
Distributor ***Pengedar***	Aurora Chemicals Sdn Bhd Puchong, Selangor
Contact Number ***Nombor Telefon***	03-80623110
Emergency Phone Number (24 hr) ***Nombor Telefon Kecemasan (24 jam)***	03-80623110
SDS Reference Number ***Number Rujukan SDS***	SDS R134a

2. HAZARDS IDENTIFICATION
PENGENALAN BAHAYA

Chemical Name ***Nama Kimia***	CAS No. ***No. CAS***	Classification Code ***Kod Pengelasan***	Labeling ***Pelabelan***		
			H-code ***Kod H***	Signal Word ***Kata Isyarat***	Hazard Pictogram ***Piktagram Bahaya***
R134a *R134a*	811-97-2	Press. Gas *Gas Tkn.*	H 280	Warning *Amaran*	

Classification of the substance
Pengelasan Bahan

Press. Gas *Gas Tkn.* : Gases under pressure (Liquefied gas)
Gas di bawah tekanan (Gas tercair)

Hazard Statement
Pernyataan Bahaya

H 280 : Contains gas under pressure; may explode if heated.
Mengandungi gas di bawah tekanan; boleh meletup jika dipanaskan

OSHA - H01 : May displace oxygen and cause rapid suffocation.
Boleh menggantikan oksigen dan menyebabkan kelemasan pantas.

CGA – HG01 : May cause frostbite.
Boleh menyebabkan reput fros.

Precautionary Statement
Pernyataan Berjaga-jaga

P 202 Do not handle until all safety precautions have been read and understood.
Jangan kendalikan bahan sehingga semua langkah berjaga-jaga keselamatan telah dibaca dan difahami.

P 262 : Do not get in eyes, on skin, or on clothing.
Elakkan daripada terkena mata,kulit atau pakaian.

P 271 + P 403 : Use only outdoors or in a well-ventilated area. Store in a well-ventilated place.
Gunakan hanya di luar bangunan atau di dalam kawasan yang dialihudarakan dengan baik. Simpan di tempat yang dialihudarakan dengan baik.

P 304, P 340, P 313 : IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical advice /attention.
JIKA TERSEDUT: Pindahkan mangsa ke kawasan berudara segar dan biarkan mangsa dalam keadaan rehat supaya mangsa dapat bernafas dengan selesa. Segera dapatkan nasihat /rawatan perubatan.

P302, P 336, P 315 : IF ON SKIN: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
JIKA TERKENA KULIT: Cairkan bahagian berfros dengan air suam. Jangan gosok bahangian yang terkena bahan. Segera dapatkan nasihat/rawatan perubatan.

CGA-PG02 : Protect from sunlight when ambient temperature exceeds

52 °C (125°F).
Melindungi dari cahaya matahari apabila suhu ambien melebihi 52°C.

CGA-PG05 : Use a back flow preventive device in the piping.
Gunakan alat peranti pencegahan aliran balik dalam paip.

CGA-PG06 : Close valve after each use and when empty.
Tutupkan injap setiap kali digunakan dan apabila kosong.

CGA-PG27 : Read and follow the Safety Data Sheet (SDS) before use.
Baca dan mengikuti risalah data keselamatan sebelum digunakan.

OSHA-PG01 : DO NOT REMOVE THIS PRODUCT LABEL (or equivalent wording).
Jangan tanggalkan label produk ini.

Other Hazards
Bahaya lain

Contact with liquid or cold vapor can cause frostbite.
Low acute toxicity.
High exposures may cause an abnormal heart rhythm and prove suddenly fatal.
Very high concentrations may cause anesthetic affects and asphyxiation.
Contains fluorinated greenhouse gases covered by the Kyoto Protocol.
Terkena cecair boleh menyebabkan kelecuran seperti reput fros (frostbite).
Ketoksikan akut rendah.
Pndedahan yang tinggi boleh menyebabkan degupan jantung yang tidak normal dan dibuktikan boleh membawa maut secara tiba-tiba.
Kepekatan yang tinggi boleh menyebabkan kesan anestetik dan kelemasan.
Mengandungi gas rumah hijau berflorin yang diliputi di Kyoto Protocol.

3. COMPOSITION/INFORMATION ON INGREDIENTS
KOMPOSISI DAN MAKLUMAT MENGENAI RAMUAN BAHAN KIMIA

Common Name *Nama Biasa*	**Ingredient** *Ramuan*	**CAS Number** *Nombor CAS*	**Specification** *Spesifikasi*	**OSHA-PEL** *Had Dedahan (OSHA PEL)*
R134a *R134a*	1,1,1,2-tetrafluoroethane	811-97-2	100% (w/w)	None established. *Tidak Diwujudkan.*

*Contains no other components or impurities which influence the classification of the product.
Tidak mengandungi komponen atau kekotoran lain yang mempengaruhi klasifikasi produk

4. FIRST AID MEASURES
LANGKAH-LANGKAH PERTOLONGAN CEMAS

Eye Contact
Sentuhan Mata

Contact with liquid or cold vapor can cause frostbite.
Immediately flush with water for at least 15 minutes, opening eyelids to ensure flushing.
Get medical attention if symptoms occur.
Terkena cecair boleh menyebabkan kelecuran seperti reput fros (frostbite).
Mencuci kawasan yang terlibat serta-merta dengan air sekurang-kurangnya 15 minit.
Dapatkan bantuan perubatan jika symptom berlaku.

Inhalation
Penyedutan

Victims should be assisted to an uncontaminated area is most important.
Move exposed person to fresh air.
If not breathing, provide artificial respiration or oxygen by trained personnel.
In the event of cardiac arrest apply external cardiac massage.
Further treatment should be symptomatic and supportive.
Keep victim warm and quiet.
PROMPT MEDICAL ATTENTION IS MANDAROTY IN ALL CASES OF OVEREXPOSURE.
RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.
Mangsa perlu dihantar ke tempat yang tidak tercemar.
Alihkan pemangsa ke kawasan yang berudara segar.
Jika pemangsa tidak bernafas, berikan pernafasan pemulihan atau oksigen oleh kakitangan yang terlatih.
Jika berlaku serangan jantung, mengurat jantung dari luar.
Pastikan mangsa dalam keadaan stabil/suam dan tenang.
PERAWATAN YANG CEKAP ADALAH WAJIB DALAM SEMUA KES PENDEDAHAN BERLEBIHAN.
ANGGOTA PENYELAMAT PERLU MEMAKAI RADAS PERNAFASAN YANG LENGKAP.

Skin Contact
Sentuhan Kulit

Take off the contaminated clothing / shoes immediately.
Flush the affected area with lukewarm water not exceeds 105^{o}F (40^{o}C) immediately.
Get medical attention if symptoms occur.
Pakaian dan kasut disaran ditanggalkan daripada individu yang terdedah.
Cuci kawasan yang bersentuhan dengan air suam yang tidak melebihi 105^{o}F (40^{o}C).
Dapatkan bantuan perubatan jika symptom berlaku.

Ingestion
Pengingesan

Unlikely route of exposure.
Do not include vomiting.
Provided the patient is conscious, wash out mouth with water and give 200-300ml of water to drink.
Get medical attention if symptoms occur.
Tidak ada kesan dalam pengguanan biasa.
Tidak termasuk muntah.
Jika magsa adalah sedar, mencuci mulut dengan air dan memberikan 200-300ml air untuk minum.
Dapatkan bantuan perubatan jika symptom berlaku

Most important symptoms and effects, both acute and delayed ***Gejala dan kesan penting, amat sakit dan berterusan***	High concentrations may cause asphyxiation. Symptoms may include loss of mobility/ consciousness. Victim may not be aware of asphyxiation. As asphyxiation progresses, nausea, vomiting, prostration, and loss of consciousness may result, eventually leading to convulsions, coma, and death. *Kepekatan yang tinggi boleh menyebabkan kelemasan.* *Simptom-simptom termasuk kehilangan mobility / kesedaran.* *Pemangsa mungkin tidak sedar diri tentang kelemasan.* *Ciri-ciri kelemasan seperti loya, muntah-muntah, sujud, dan tidak sedar diri boleh mengakibatkan sawan, koma dan kematian.*

5. FIRE FIGHTING MEASURES
LANGKAH-LANGKAH PEMADAMAN KEBAKARAN

Suitable extinguishing media ***Media pemadaman yang sesuai***	Use an extinguishing agent suitable for the surrounding fire. *Gunakan agen pemadaman yang sesuai.*
Unsuitable extinguishing media ***Media pemadaman yang tidak sesuai***	None known. *Tidak diketahui.*
Special hazards arising from the chemical ***Bahaya khas yang timbul daripada bahan kimia***	Exposure to fire may cause containers to rupture/explode. R134a does not support life. It act as a simple asphyxiant. *Gas dalam silinder boleh memecuk dengan pantas dari silinder atau silinder akan pecah apabila dibakarkan.* *R134a tidak menyokong kehidupan. Merupakan gas penyesak.*
Special protective equipment and precautions for fire fighters ***Peralatan pelindung khas dan langkah berjaga-jaga untuk pasukan pemadam api***	In case of fire: Stop leak if safe to do so. Continue water spray from protected position until container stays cool. In confined space use self-contained breathing apparatus (open-circuit positive pressure compressed air type) in combination with fire kit. Thermal decomposition will evolve very toxic and corrosive vapors (hydrogen fluoride). HFC 134a is not flammable in air under ambient condition of temperature and pressure. Certain mixtures of HFC 134a and air when under pressure maybe flammable. Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions. Safety gloves and shoes, or boots, should be worn when handling cylinders. *Hentikan aliran gas jika boleh.* *Siramkan sekitaran kontena dengan air untuk tujuan penyejukan.* *Bilangan orang dalam tempat berapi terhad dan singkirkan sekitar kawasan dalam semua arah.* *Ahli-ahli bomba harus pakai Perlindung respirasi (SCBA).* *Teruskan menyejukan silinder yang terdedah kepada api sehingga api dipadamkan.* *Penguraian haba akan menghasilkan wap yang bertosik dan mengakis (hidrogen florida).*

HFC 134a adalah tidak mudah terbakar bawah keadaan ambien suhu dan tekanan.
Campuran tertentu HFC 134a dan udara mungkin mudah terbakar sekiranya bertekanan.
Campuran tertentu HFCs dan klorin boleh menjadi mudah terbakar atau reaktif di bawah syarat-syarat tertentu.
Apabila mengendalikan silinder, sarung tangan dan kasut keselamatan, atau kasut perlu dipakai.

6. ACCIDENTAL RELEASE MEASURES
LANGKAH-LANGKAH PERLEPASAN TIDAK SENGAJA

Personal precautions
Kecemasan diri

Ensure suitable personal protection (including respiratory protection) during removal of spillages.
Evacuate surrounding areas.
Keep unnecessary and unprotected personnel from entering.
Pastikan perlindungan diri yang sesuai diberikan (termasuk perlindungan pernafasan) semasa menyingkiran pertumpuhan.
Kosongkan kawasan persekitaran.
Tidak membenarkan kakitangan yang tidak berkaitan dan tidak dilindungi daripada memasuki kawasan kejadian.

Environmental precautions
Kecemasan Alam sekitar

If safe to do so: isolate the source of the leak.
Large spillages: Ventilate area.
Contain spillages with sand, earth or any suitable adsorbant material.
Try to stop release.
Prevent from entering sewers, basements and work pits, or any place where its accumulation can be dangerous.
Jika selamat untuk berbuat demikian: mengasingkan punca kebocoran.
Tumpahan besar: perlu ventilasikan kawasan.
Meliputi tumpahan dengan pasir atau sebarang bahan penyerap yang sesuai.
Hentikan aliran gas jika boleh..
Elakkan daripada memasuki pembetung, bawah tanah dan lubang-lubang kerja, atau mana-mana tempat di mana pengumpulan boleh mendatangkan bahaya.

7. HANDLING AND STORAGE
PENGENDALIAN DAN PENYIMPANAN

Precaution for safe handling
Langkah berjaga-jaga semasa pengendalian

Avoid inhalation of high concentrations of vapors.
Atmospheric level should be controlled in compliance with the occupational exposure limit. Atmospheric concentrations well below the occupational exposure limit can be achieved by good occupational hygiene practice.
The vapor is heavier than air, high concentrations may be produced at low levels where general ventilation is poor.
In such cases, provide adequate ventilation or wear suitable respiratory protective equipment with positive air supply.

Avoid contact with naked flames and hot surfaces as corrosive and very toxic decomposition products can be formed. Avoid contact between the liquid and skin and eyes.
Use only properly specified equipment which is suitable for this product, its supply pressure and temperature.
Suck back of water into the container must be prevented.
Do not allow back feed into the container.
Contact your gas supplier if in doubt.
Never use direct flame or electrical heating devices to raise the pressure of cylinder.
Valve protection caps must remain in place unless container is secured with valve outlet piped to use point.
Do not drag, slide or roll cylinders.
Use a suitable hand truck for cylinder movement.
Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.
Use a pressure regulator when connecting cylinder to lower pressure piping or systems.
Avoid venting to atmosphere.
Elakkan daripada penyedutan wap ini yang kepekatan tinggi
Tahap atmosfera harus dikawal dengan mematuhi had pendedahan pekerjaan. Kepekatan atmosfera jauh di bawah had pendedahan pekerjaan boleh dicapai dengan mengamalkan amalan kebersihan pekerjaan yang baik.
Gas ini lebih berat daripada udara, gas ini mungkin terkumpul di ketinggian yang rendah di mana ventilasi/pengudaraan am adalah tidak bagus. Dalam kes sedemikian, memberikan pengudaraan yang cukup atau memakai alat pernafasan yang sesuai.
Elakkan sentuhan dengan api terbuka dan permukaan panas kerana produk penguraian yang menghakis dan sangat toksik boleh dihasilkan. Elakkan kulit dan mata bersentuh dengan cecair ini.
Hanya menggunakkan peralatan yang dinyatakan dengan cara betul dan sesuai,
Pengaliran air balik ke silinder mesti dielakkan.
Hubungi pembekal gas jika ada keraguan.
Jangan panaskan silinder bermaksud meningkatkan kadar pengeluaran produk daripada silinder.
Perlindungan penutup injap mesti tinggal di tempat tersebut sekiranya kontena adalah selamat dengan perlindungan tempat pengeluaran injap digunakan.
Jangan baringkan silinder.
Gunakan troli untuk perpindahan silinder
Gunakan pengawal injap untuk jalan sehala bagi melindungi aliran berbalik yang bahaya ke dalam sistem.
Gunakan pengawal tekanan semasa menyambung silinder ke sistem tekanan yang rendah.
Elakkan daripada pelepasan gas ini ke atmosfera.

Condition for safe storage
Keadaan penyimpanan yang selamat

Keep away from ignition sources (including static discharges).
Do not allow the temperature where cylinders are stored to exceed 125^{o}F (52^{0}C).
Use a “first-in-first out” inventory system to prevent full cylinders from being stored for excessive period of time.
Store in cool, dry, well-ventilated area of non-combustible

construction away from heavily trafficked areas and emergency exits
Full and empty cylinders should be segregated.
Containers should not be stored in conditions likely to encourage corrosion.
Container should be stored in the vertical position and properly secured to prevent falling over.
Outside or detached storage is preferred.
Post "No Smoking" signs in use or storage areas.
There should be no accidental ignition in areas where this product is being used or stored.
Avoid storing near to the intake of air conditioning units, boiler units, and open drains.
Jauhkan dari punca pencucuhan (termasuk pelepasan statik).
Dilarang menyimpan silinder di tempat yang suhu melebihi 125°F(52°C).
Gunakan sistem inventori ' Datang awal Keluar awal" untuk mengelakkan silinder yang penuh disimpan dalam jangka masa yang terlalu lama.
Simpan dalam tempat yang sejuk, kering, peredaran udara yang baik, jauhkan daripada tempat yang tersumbat dan kecemasan keluar.
Silinder yang penuh dan kosong harus diasingkan.
Jangan menyimpan di tempat yang menggalakkan hakisan.
Kotena hendaklah disimpan dalam kedudukan menegak dan dijamin selamat untuk mengelakkan terjatuh.
Kawasan penyimpan luaran adalah diperlukan.
Tampalkan penunjuk " Dialarang merokok" dalam kawasan penggunaan dan penyimpanan.
Kawasan untuk penyimpanan dan penggunaan seharusnya tidak mempunyai sumber pemcucuhan.
Elakkan menyimpan berhampiran pengambilan unit penyaman udara, unit dandang

8. EXPOSURE CONTROLS/PERSONAL PROTECTION
KAWALAN PENDEDAHAN DAN PELINDUNGAN DIRI

Control parameters
Parameter kawalan

Exposure Limit: OSHA-PEL

Chemical Name *Nama Bahan Kimia*	**Eight-hour time-weighted average airborne concentration** *Kepekatan Purata Berpemberat Masa (TWA)*	
	ppm	**mg/m^3**
R134a (1,1,1,2-Tetrafluoroethane)	-	-

Appropriate engineering controls
Kawalan Kejuruteraan yang Sesuai

Use local exhaust and general ventilation systems.
Engineering control measures are preferred to reduce oxygen depleted atmospheres.
General methods include force-draught ventilation, separate from other exhaust ventilation systems.
Ensure that sufficient fresh air enters at, or near, floor level.

Gunakan pengalihudaraan ekzos setempat.
Quantiti yang kecil boleh dikendali dalam tempat peredaran.
Atmosfera oksigen berkurangan boleh dielakkan dengan kawalan kejuruteraan yang sesuai.
Kaedah-kaedah termasuk sistem pengudaraan draft, asingkan daripada sistem pengudaraan ekzos.
Pastikan udara segar yang mencukupi masuk pada atau berhampiran,dengan tahap lantain.

Personal protection equipment
Peralatan perlindungan peribadi

Wear goggles for eye protection.
Protective gloves made of any suitable material.
Contact lens should not be worn when working.
Wear suitable hand, body and head protection.
Do not eat, drink or smoke when using the product.
For emergency release use a positive pressure NIOSH approved air supplying respirator systems (SCBA or airline/escape bottle)
Pakai cermin mata keselamatan.
Perlindungan kerja industri sarung tangan dibuat daripada bahan material yang sesuai.
Pakai perlindungan kepala, tangan dan badan yang sesuai.
Jangan makan, minum atau merokok semasa menggunakan produk.
Gunakan alat pernafasan dengan penutup yang melindungi semua muka yang diluluskan
oleh NIOSH.

9. PHYSICAL AND CHEMICAL PROPERTIES
SIFAT FIZIKAL DAN KIMIA

Appearance ***Penampilan***	:	Colorless, Liquefied gas *Tidak berwarna, gas tercair*
Odour ***Bau***	:	Slightly ethereal. .
Odour threshold ***Ambang bau***	:	Odour threshold is subjective and inadequate to warn for over exposure. *Had ambang bau adalah subjektif dan tidak mencukupi untuk memberi amaran kepada pendedahan yang lebih.*
pH ***pH***	:	Not applicable *Tidak berkenaan*
Melting point / Freezing point ***Takat lebur / Takat beku***	:	-101 ^{o}C
Boiling point ***Takat didih***	:	-26.5 ^{o}C
Flash point ***Takat kilat***	:	Not applicable *Tidak berkenaan*
Evaporation rate ***Kadar penyejatan***	:	Not available *Tidak dicatatkan.*

Flammability ***Takat kebakaran***	:	Not available *Tidak dicatatkan.*
Upper/lower explosive limit **Had atas/bawah letupan**	:	Not available *Tidak dicatatkan.*
Vapour pressure ***Tekanan Wap***	:	4270 mmHg at 20^{o}C *4270 mmHg pada suhu 20^{o}*
Vapour density (Air =1) ***Ketumpatan gas (Udara=1)***	:	3.66 at normal boiling point *3.66 pada takat didih normal.*
Relative density ***Ketumpatan relatif***	:	1.208 Water : 25^{o}C, 1atm *1.208 Air: 25^{o}C, 1atm*
Solubility (H_2O) ***Keterlarutan (H_2O)***	:	Slightly soluble *Agak sukar larut.*
Partition coefficient ***Pekali sekatan***	:	1.06 logPow The product is more soluble in octanol. *1.06 logPow* *Produk ini lebih larut dalam oktanol.*
Auto ignition temperature ***Suhu Nyalahan sendiri***	:	Not applicable *Tidak berkenaan.*
Decomposition temperature ***Suhu penguraian***	:	Not available *Tidak dicatatkan.*
Viscosity ***Kelikatan***	:	Not applicable *Tidak berkenaan.*

10. STABILITY AND REACTIVITY
KESTABILAN DAN KEREAKTIFAN

Reactivity ***Kereaktifan***	No reactivity hazard other than the effects described in sub-sections below. *Tidak beraktif selain kesan yang dihuraikan di seksyen ini.*
Chemical Stability ***Kestabilan Kimia***	Stable. *Stabil.*
Possibility of hazardous reactions ***Kemungkinan tindak balas berbahaya***	Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions. Can react violently if in contact with alkali metals and alkaline earth metals - sodium, potassium, barium. *Sesetengah campuran HFCs dan klorin boleh menjadi mudah terbakar atau reaktif di bawah syarat-syarat tertentu.* *Sangat bertindak balas jika bersentuhan dengan logam alkali dan alkali bumi logam – natrium, kalium, barium.*
Condition to avoid ***Keadaan yang dilarang***	Keep away from heat/sparks/open flames/hot surfaces – No smoking. *Juahkan daripada haba/ percikan api/ nylaan terbuka/*

permukaan panas – Dilarang merokok.

Incompatible materials ***Bahan yang tidak sepadan***	Incompatible materials: finely divided metals, magnesium and alloys containing more than 2% magnesium. *Bahan tidak serasi: logam halus, magenesium dan aloi yang mengandungi lebih daripada 2% magnesium.* .
Hazardous decomposition products ***Produk penghuraian yang berbahaya***	Hydrogen fluoride by thermal decomposition and hydrolysis. *Hidrolisis dan penguraian haba akan menghasilkan hidrogen florida.*

11. TOXICOLOGICAL INFORMATION
MAKLUMAT TOKSIKOLOGI

Information on toxicological effects
Maklumat tentang kesan toksikologi

Acute toxicity ***Ketoksikan lampau***	Oral: LD_{50} > No information available. Dermal: LD_{50} > No information available. Inhalation: LC_{50} > Rat, 2,080,000 mg/m^3 4hrs *Oral: LD_{50} > Tidak dicatatkan.* *Dermal: LD_{50} > Tidak dicatatkan* *Penyedutan: LC_{50} > Tikus, 2,080,000 mg/m^3 4jam*
Skin corrosion / irritation ***Kakisan / kerengsaan Kulit***	Not classified *Tidak diklasifikasikan..*
Serious eye damage/ irritation ***Kerosakan mata yang serius / kerengsaan***	Not classified *Tidak diklasifikasikan..*
Respiratory or skin sensitization ***Pernafasan atau pemekaan kulit***	Not classified *Tidak diklasifikasikan..*
Germ cell mutagenicity ***Kemutagenan sel***	Not classified *Tidak diklasifikasikan..*
Carcinogenicity product ***Produk menghasilkan barah***	Not classified *Tidak diklasifikasikan..*
Reproductive toxicity product ***Kesan pembiakan toksi***	Not classified *Tidak diklasifikasikan..*
Specific target organ toxicity – single exposure product. ***Organ sasaran ketoksikan - pendedahan sekali***	Not classified *Tidak diklasifikasikan..*
Specific target organ toxicity – repeated exposure product ***Organ sasaran ketoksikan - pendedahan berulangan***	Not classified *Tidak diklasifikasikan..*
Aspiration hazard product	Not applicable to gases and gas mixtures.

Bahaya pernafasan	*Tidak.*

12. ECOLOGICAL INFORMATION
MAKLUMAT EKOLOGI

Ecotoxicity effect
Kesan ketoksikan Ekologi

Acute toxicity product ***Ketoksikan lampau***	No ecological damage caused by this product *Tiada kerosakan ekologi yang disebabkan oleh produk ini*
Additional ecological information ***Maklumat tambahan Ekologi***	No ecological damage caused by this product. *Tiada kerosakan ekologi yang disebabkan oleh produk ini*
Persistence and degradability ***Kerintangan dan Kebolehbiorosotan***	Not readily biodegradable. *Tidak mudah terbiodegradasikan.*
Bioaccumulative potential ***Keupayaan Pembiotumpukan***	Not expected to bioaccumulate due to the low log Kow (log Kow < 4). *Tidak dijangka akan bioakumulasi kerana nilai log Kow yang rendah (log Kow < 4).*
Mobility in soil ***Kebolehgerakan dalam tanah***	No data available. *Tidak ada data..*
Other adverse effects ***Kesan buruk yang lain***	Effect on ozone layer : None Global Warning Potential [CO_2=1] : 1300. *Kesan pada lapisan ozon : Tiada* *Potensi Pemanasan Global[CO_2=1]: 1300*

13. DISPOSAL CONSIDERATIONS
MAKLUMAT PELUPUSAN

Waste from residue / unused product ***Sisa daripada baki / produk yang tidak digunakan***	Do not attempt to dispose of residual waste or unused quantities. Contact supplier if guidance is required. *Jangan melupuskan sisa-sisa yang tidak digunakan.* *Hubungi pembekal jika garis panduan diperlukan.*
Contaminated packaging ***Bungkusan tercemar***	Do not reuse empty containers. Empty remaining contents. Dispose of container and unused contents in accordance with local and national regulation. Return cylinder to supplier *Jangan guna semula bekas kosong.* *Tinggalkan sedikit baki gas dalam bekas kosong* *Kaedah pelupusan hendaklah mematuhi undang-undang alam sekitar kebangsaan dan peraturan-peraturannya.* *Kembalikan silinder kepada pembekal,*

14. TRANSPORT INFORMATION

MAKLUMAT PENGANGKUTAN

UN Number ***Nombor UN***	UN 3159
UN proper shipping name ***Nama penghantaran UN yang betul***	1,1,1,2-Tetrafluoroethane *1,1,1,2-tetrafloroetana*
Transport hazard class(es) ***Kelas bahaya pengangkutan***	2.2
Packing group ***Kumpulan bungkusan***	-
Environmental hazards ***Bahaya alam sekitar***	Not applicable *Tidak berkaitan*
Special precautions for user ***Langkah berjaga-jaga khas***	None *Tiada*
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code ***Pengangkutan dalam jumlah yang bangyak mengikut ANNEX II MARPOL73/78 dan kod IBC***	Not available *Tidak dicatatkan.*
Others Information ***Maklumat lain***	Ensure the driver is understand well on the potential hazards of the load and knows what to do in the event of an accident or an emergency. Secured the product containers before transporting it. Ensure that the cylinder valve is closed and not leaking. Container valve guards or caps should be in place. Ensure adequate air ventilation. *Memastikan pemandu memahami potensi kebahayaan dan tahu langkah yang perlu dilakukan sekiranya berlaku kemalangan atau kecemasan.* *Bercagar bekas produk sebelum diangkut.* *Pastikan injap silinder ditutup dan tiadak kebocoran.* *Pastikan pengudaraan yang mencukupi.*

15. REGULATORY INFORMATION
MAKLUMAT PENGAWALSELIAAN

Contact local government authority.
Hubungi pihak berkuasa tempatan

16. OTHER INFORMATION
MAKLUMAT LAIN

Date of Preparation / Revision of SDS ***Tarikh penyediakan /nombor semakan***	10 March 2015

Legend to the abbreviations ad acronyms used
Singkatan yang digunakan

Classification of the substance ***Pengelasan Bahan***	Press. Gas *Gas Tkn.*	:	Gases under pressure (Liquefied gas) *Gas di bawah tekanan (Gas tercair)*
	LC_{50}	:	Lethal Concentration *Kepekatan Maut*
	LD_{50}	:	Median Lethal Dose *Dos Maut Median*
	EC50	:	Half Maximal Effective Concentration *Kepekatan Berkesan 50%*

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