SECTION 1. IDENTIFICATION

Product name	:	Honeywell Solstice® L41y Refrigerant (R-452B)
Number	:	000000020160
Product Use Description	:	Refrigerant
Manufacturer or supplier's details	:	Honeywell International Inc. 115 Tabor Road Morris Plains, NJ 07950-2546
For more information call	:	800-522-8001 +1-973-455-6300 (Monday-Friday, 9:00am-5:00pm)
In case of emergency call	:	**Medical: 1-800-498-5701 or +1-303-389-1414**
	:	**Transportation (CHEMTREC): 1-800-424-9300 or +1-703-527-3887**
	:	
	:	(24 hours/day, 7 days/week)

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form	:	Liquefied gas
Color	:	clear and colourless
Odor	:	slight ether-like
Hazard Summary	:	Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Rapid evaporation of

the liquid may cause frostbite.

Classification of the substance or mixture

Classification of the substance or mixture	:	Flammable gases, Category 1 Gases under pressure, Liquefied gas Simple Asphyxiant

GHS Label elements, including precautionary statements

Symbol(s) :

Signal word : Danger

Hazard statements : Extremely flammable gas.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements : **Prevention:**
Keep away from heat/sparks/open flames/hot surfaces. No smoking.

Response:
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
Eliminate all ignition sources if safe to do so.

Storage:
Protect from sunlight. Store in a well-ventilated place.

Hazards not otherwise classified : Excessive exposure may cause central nervous system effects including drowsiness and dizziness. Excessive exposure may also cause cardiac arrhythmia.
May cause frostbite.

Carcinogenicity

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP, IARC, or OSHA.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Mixture

Chemical name	CAS-No.	Concentration
Difluoromethane	75-10-5	67.00 %
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	26.00 %
Pentafluoroethane	354-33-6	7.00 %

SECTION 4. FIRST AID MEASURES

Inhalation : Move to fresh air. If breathing is irregular or stopped, administer artificial respiration. Use oxygen as required, provided a qualified operator is present. Call a physician. Do not give drugs from adrenaline-ephedrine group.

Skin contact : After contact with skin, wash immediately with plenty of water. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with a clean, soft cloth or similar covering. If symptoms persist, call a physician.

Eye contact : Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Ingestion : Unlikely route of exposure. As this product is a gas, refer to the inhalation section. Do not induce vomiting without medical advice. Call a physician immediately.

Notes to physician

Indication of immediate medical attention and special treatment needed, if necessary	:	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. Treat frost-bitten areas as needed.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Specific hazards during firefighting	:	Contents under pressure. Flammable. Container may rupture on heating. Cool closed containers exposed to fire with water spray. Do not allow run-off from fire fighting to enter drains or water courses. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Rapid evaporation of the liquid may cause frostbite. Fire may cause evolution of: Hydrogen fluoride Carbon oxides Halogenated compounds Carbonyl halides
Special protective equipment for firefighters	:	In the event of fire and/or explosion do not breathe fumes. Wear self-contained breathing apparatus and protective suit. No unprotected exposed skin areas.
Further information	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Immediately evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Wear personal protective equipment. Unprotected persons must be kept away. Remove all sources of ignition. Avoid skin contact with leaking liquid (danger of frostbite). Ventilate the area. After release, disperses into the air. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Avoid accumulation of vapours in low areas. Unprotected personnel should not return until air has been tested and determined safe. Ensure that the oxygen content is >= 19.5%.
Environmental precautions	:	Prevent further leakage or spillage if safe to do so. The product evapourates readily.
Methods and materials for containment and cleaning up	:	Ventilate the area.

SECTION 7. HANDLING AND STORAGE

Handling

Precautions for safe handling	:	Handle with care. Avoid inhalation of vapour or mist. Do not get in eyes, on skin, or on clothing. Wear personal protective equipment. Use only in well-ventilated areas. Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Follow all standard safety precautions for handling and use of compressed gas cylinders. Protect cylinders from physical damage. Do not puncture or drop cylinders, expose them to open flame or excessive heat.

Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.
Do not remove screw cap until immediately ready for use.
Always replace cap after use.

Advice on protection against fire and explosion : Vapours may form explosive mixture with air.
Container hazardous when empty.
Keep product and empty container away from heat and sources of ignition.
Electrical equipment should be protected to the appropriate standard.

Storage

Conditions for safe storage, including any incompatibilities : Keep containers tightly closed in a dry, cool and well-ventilated place.
Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use.
Keep away from heat and sources of ignition.
Protect cylinders from physical damage.
Store away from incompatible substances.
Storage rooms must be properly ventilated.
Ensure adequate ventilation, especially in confined areas.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective measures : Do not breathe vapour.
Avoid contact with skin, eyes and clothing.
Ensure that eyewash stations and safety showers are close to the workstation location.

Engineering measures : General room ventilation is adequate for storage and handling.
Perform filling operations only at stations with exhaust ventilation facilities.

Eye protection : Do not wear contact lenses.
Wear as appropriate:
Safety glasses with side-shields
If splashes are likely to occur, wear:

Goggles or face shield, giving complete protection to eyes

Hand protection : Leather gloves
In case of contact through splashing:
Protective gloves
Neoprene gloves
Polyvinyl alcohol or nitrile- butyl-rubber gloves

Skin and body protection : Avoid skin contact with leaking liquid (danger of frostbite).
Wear cold insulating gloves/ face shield/ eye protection.

Respiratory protection : In case of insufficient ventilation wear suitable respiratory equipment.
Wear a positive-pressure supplied-air respirator.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
For rescue and maintenance work in storage tanks use self-contained breathing apparatus.

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice.
Ensure adequate ventilation, especially in confined areas.
Avoid contact with skin, eyes and clothing.
Remove and wash contaminated clothing before re-use.
Keep working clothes separately.

Exposure Guidelines

Components	CAS-No.	Value	Control parameters	Update	Basis
Difluoromethane	75-10-5	TWA : Time weighted average	2,200 mg/m3 (1,000 ppm)	2007	WEEL:US. OARS. WEELs Workplace Environmental Exposure Level Guide

Difluoromethane	75-10-5	TWA : Time weighted average	(1,000 ppm)	1994	Honeywell:Limit established by Honeywell International Inc.

2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	TWA : Time weighted average	(500 ppm)	2009	WEEL:US. OARS. WEELs Workplace Environmental Exposure Level Guide
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	TWA : Time weighted average	(500 ppm)	03 15 2010	Honeywell:Limit established by Honeywell International Inc.
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	STEL : Short term exposure limit	(1,500 ppm)	03 15 2010	Honeywell:Limit established by Honeywell International Inc.
Pentafluoroethane	354-33-6	TWA : Time weighted average	4,900 mg/m3 (1,000 ppm)	2007	WEEL:US. OARS. WEELs Workplace Environmental Exposure Level Guide
Pentafluoroethane	354-33-6	TWA : Time weighted average	(1,000 ppm)		Honeywell:Limit established by Honeywell International Inc.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state : Liquefied gas

Color : clear and colourless

Odor : slight ether-like

pH : Note: Not applicable

Boiling point/boiling range	:	Note: not determined
Flash point	:	Note: Not applicable
Evaporation rate	:	Note: not determined
lower flammability limit	:	11.9 %(V)
upper flammability limit	:	Note: not determined
Vapor pressure	:	1.42 MPa at 21.1 °C(70.0 °F)
Vapor density	:	Note: not determined, (Air = 1.0)
Density	:	1.01 g/cm3
Water solubility	:	Note: negligible
Ignition temperature	:	Note: no data available

SECTION 10. STABILITY AND REACTIVITY

Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	Hazardous polymerisation does not occur.

Conditions to avoid	:	Protect from heat/overheating. Decomposes under high temperature. Contains gas under pressure; may explode if heated. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Keep away from direct sunlight. Some risk may be expected of corrosive and toxic decomposition products.
Incompatible materials	:	Potassium Calcium Powdered metals Finely divided aluminium Finely divided magnesium Zinc
Hazardous decomposition products	:	Halogenated compounds Hydrogen fluoride Carbon oxides Carbonyl halides

SECTION 11. TOXICOLOGICAL INFORMATION

Acute inhalation toxicity

Difluoromethane	:	LC50: > 520000 ppm Exposure time: 4 h Species: Rat
2,3,3,3-Tetrafluoroprop-1-ene	:	LC50: > 400000 ppm Exposure time: 4 h Species: Rat Method: OECD Test Guideline 403
Pentafluoroethane	:	> 769000 ppm Exposure time: 4 h Species: Rat

Acute dermal toxicity	:	Acute toxicity estimate: > 5,000 mg/kg Method: Calculation method
	:	Acute toxicity estimate: > 5,000 mg/kg Method: Calculation method
Skin irritation		
2,3,3,3-Tetrafluoroprop-1-ene	:	Note: Not applicable study technically not feasible
Eye irritation		
2,3,3,3-Tetrafluoroprop-1-ene	:	Note: Not applicable study technically not feasible
Sensitisation		
Difluoromethane	:	Cardiac sensitization Species: dogs Note: No-observed-effect level >350 000 ppm
2,3,3,3-Tetrafluoroprop-1-ene	:	Dermal Note: Not applicable, as this product is a gas. study technically not feasible
Pentafluoroethane	:	Cardiac sensitization Species: dogs Note: No-observed-effect level 75 000 ppm Lowest observed effect level 100 000 ppm
Repeated dose toxicity		
Difluoromethane	:	Species: Rat Application Route: Inhalation Exposure time: (90 d) NOEL: 50000 ppm Subchronic toxicity
2,3,3,3-Tetrafluoroprop-1-ene	:	Species: Rat Application Route: Inhalation

Exposure time: (2 Weeks)
No-observed-effect level: 50000 ppm
Method: OECD Test Guideline 412

Species: Rat
Application Route: Inhalation
Exposure time: (4 Weeks)
NOAEL (No observed adverse effect level): 50000 ppm
Method: OECD Test Guideline 412

Species: Rat
Application Route: Inhalation
Exposure time: (13 Weeks)
NOAEL (No observed adverse effect level): 50000 ppm
Method: OECD Test Guideline 413

Species: Rabbit, male
Application Route: Inhalation
Exposure time: (28 d)
No-observed-effect level: 500 ppm
Method: OECD Test Guideline 412
There are no observed toxicological effects, which result in classification as a specific target organ toxicant.

Species: Rabbit, female
Application Route: Inhalation
Exposure time: (28 d)
No-observed-effect level: 1000 ppm
Method: OECD Test Guideline 412
There are no observed toxicological effects, which result in classification as a specific target organ toxicant.

Species: Mini-pig
Application Route: Inhalation
Exposure time: (28 d)
NOAEL (No observed adverse effect level): 10000 ppm
highest exposure tested

Pentafluoroethane : Species: Rat
Application Route: Inhalation
Exposure time: (4 Weeks)
NOEL: 50000 ppm

Subchronic toxicity

Genotoxicity in vitro : Note: no data available

Genotoxicity in vivo

Difluoromethane : Species: Mouse
Cell type: Bone marrow
Method: Mutagenicity (micronucleus test)
Result: negative

2,3,3,3-Tetrafluoroprop-1-ene : Species: Mouse
Cell type: Micronucleus
Dose: up to 200,000 ppm (4 hour)
Method: OECD Test Guideline 474
Result: negative

: Test Method: Unscheduled DNA synthesis
Dose: up to 50,000 ppm (4 weeks)
Method: OECD Test Guideline 486
Result: negative

: Species: Rat
Cell type: Micronucleus
Dose: up to 50,000 ppm (4 weeks)
Method: OECD Test Guideline 474
Result: negative

Carcinogenicity

2,3,3,3-Tetrafluoroprop-1-ene : Species: Rat
Note: Not classified as a human carcinogen. Substance not expected to be a carcinogen based on available data.

Teratogenicity

Difluoromethane : Species: Rat
Dose: NOEL - 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.

Species: Rabbit

Dose: NOEL - 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.

Pentafluoroethane : Species: Rabbit
Application Route: Inhalation exposure
NOAEL,Teratog: 50,000 ppm
NOAEL,Maternal: 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.

Species: Rat
Application Route: Inhalation exposure
NOAEL,Teratog: 50,000 ppm
NOAEL,Maternal: 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.

Aspiration toxicity : Not applicable

SECTION 12. ECOLOGICAL INFORMATION

Toxicity to fish
2,3,3,3-Tetrafluoroprop-1-ene : LC50: > 197 mg/l
Exposure time: 96 h
Species: Cyprinus carpio (Carp)
Method: OECD Test Guideline 203
Note: No demonstrable toxic effect in saturated solution.

Toxicity to daphnia and other aquatic invertebrates
2,3,3,3-Tetrafluoroprop-1-ene : EC50: > 83 mg/l
Exposure time: 48 h
Species: Daphnia magna (Water flea)
Method: OECD Test Guideline 202

Toxicity to algae
2,3,3,3-Tetrafluoroprop-1-ene : EC50: > 100 mg/l
Species: Scenedesmus capricornutum (fresh water algae)
Method: OECD Test Guideline 201

Bioaccumulation 2,3,3,3-Tetrafluoroprop-1-ene	:	Note: Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.
Biodegradability Difluoromethane	:	Note: Minimal
2,3,3,3-Tetrafluoroprop-1-ene	:	Result: Not readily biodegradable. Method: OECD Test Guideline 301F
Pentafluoroethane	:	Result: Not readily biodegradable. Value: 5 % Method: OECD 301 D

Further information on ecology

Additional ecological information	:	This product is subject to U.S. Environmental Protection Agency Clean Air Act Regulations at 40 CFR Part 82. This product contains greenhouse gases which may contribute to global warming. Do NOT vent to the atmosphere. To comply with provisions of the U.S. Clean Air Act, any residual must be recovered.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods	:	Observe all Federal, State, and Local Environmental regulations.
Note	:	This product is subject to U.S. Environmental Protection Agency Clean Air Act Regulations Section 608 in 40 CFR Part 82 regarding refrigerant recycling.

SECTION 14. TRANSPORT INFORMATION

DOT	UN/ID No.	:	UN 3161
	Proper shipping name	:	LIQUEFIED GAS, FLAMMABLE, N.O.S. (Difluoromethane, R-1234yf, Pentafluoroethane)

	Class		2.1
	Packing group		
	Hazard Labels		2.1
IATA	UN/ID No.	:	UN 3161
	Description of the goods	:	LIQUEFIED GAS, FLAMMABLE, N.O.S. (Difluoromethane, R-1234yf, Pentafluoroethane)
	Class	:	2.1
	Hazard Labels	:	2.1
	Packing instruction (cargo aircraft)	:	200
IMDG	UN/ID No.	:	UN 3161
	Description of the goods	:	LIQUEFIED GAS, FLAMMABLE, N.O.S. (DIFLUOROMETHANE, R-1234yf, PENTAFLUOROETHANE)
	Class	:	2.1
	Hazard Labels	:	2.1
	EmS Number	:	F-D, S-U
	Marine pollutant	:	no

SECTION 15. REGULATORY INFORMATION

Inventories

US. Toxic Substances Control Act	:	On TSCA Inventory
Australia. Industrial Chemical (Notification and Assessment) Act	:	On the inventory, or in compliance with the inventory
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL)	:	All components of this product are on the Canadian DSL
Japan. Kashin-Hou Law List	:	On the inventory, or in compliance with the inventory

Korea. Existing Chemicals Inventory (KECI)	:	On the inventory, or in compliance with the inventory
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	:	Not in compliance with the inventory
China. Inventory of Existing Chemical Substances	:	On the inventory, or in compliance with the inventory
New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand	:	On the inventory, or in compliance with the inventory
TSCA 12B	:	US. Toxic Substances Control Act (TSCA) Section 12(b) Export Notification (40 CFR 707, Subpt D)
		2,3,3,3-Tetrafluoroprop-1-ene 754-12-1

National regulatory information

US. Toxic Substances Control Act (TSCA) Section 5(a)(2) Final Significant New Use Rules (SNURs) (40 CFR 721, Subpt E)	:	
	:	Issued.
	:	2,3,3,3-Tetrafluoroprop-1-ene 754-12-1
SARA 302 Components	:	No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.
SARA 313 Components	:	This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.
SARA 311/312 Hazards	:	Fire Hazard Sudden Release of Pressure Hazard Acute Health Hazard

California Prop. 65	:	 **WARNING:** This product can expose you to chemicals, listed below, known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.
		Dichloromethane 75-09-2
		Chloromethane 74-87-3
Massachusetts RTK	:	Dichloromethane 75-09-2
Pennsylvania RTK	:	Difluoromethane 75-10-5

SECTION 16. OTHER INFORMATION

		HMIS III	NFPA
Health hazard	:	1	2
Flammability	:	4	4
Physical Hazard	:	0	
Instability	:		0

Hazard rating and rating systems (e.g. HMIS® III, NFPA): This information is intended solely for the use of individuals trained in the particular system.

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. Final determination of suitability of any material is the sole responsibility of the user. This information should not constitute a guarantee for any specific product properties.

Changes since the last version are highlighted in the margin. This version replaces all previous versions.
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