Solstice® L40X (R-455A)

000000018891

SECTION 1. IDENTIFICATION

Product name	:	Solstice® L40X (R-455A)
Number	:	000000018891
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
Odor	:	slight

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 : May cause frostbite.
May cause cardiac arrhythmia.
May cause eye and skin irritation.

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
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	75.50 %

Difluoromethane	75-10-5	21.50 %
Carbon dioxide	124-38-9	3.00 %

SECTION 4. FIRST AID MEASURES

General advice : First aider needs to protect himself. Move out of dangerous area. Take off all contaminated clothing immediately.

Inhalation : Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Use oxygen as required, provided a qualified operator is present. Call a physician.

Skin contact : After contact with skin, wash immediately with plenty of water. Rapid evaporation of the liquid may cause frostbite. 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. Call a physician. Wash contaminated clothing before re-use.

Eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In case of frostbite water should be lukewarm, not hot. Call a physician.

Ingestion : Unlikely route of exposure. As this product is a gas, refer to the inhalation section. Do not induce vomiting without medical advice. If conscious, drink plenty of water. Never give anything by mouth to an unconscious person. Call a physician immediately.

Notes to physician

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

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : In case of fire, allow gas to burn if flow cannot be shut off

immediately.
Apply water from a safe distance to cool container and protect surrounding area.
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Specific hazards during firefighting : Flammable gas.
Contents under pressure.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Vapors may travel to areas away from work site before igniting/flashing back to vapor source.
Fire or intense heat may cause violent rupture of packages.
Cool closed containers exposed to fire with water spray.
Do not allow run-off from fire fighting to enter drains or water courses.
Fire may cause evolution of:
Hydrogen fluoride
Carbonyl halides
Halogenated compounds
Carbon oxides

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 : In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.

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.
Wear self-contained breathing apparatus and protective suit.
Eliminate all ignition sources if safe to do so.
Avoid skin contact with leaking liquid (danger of frostbite).
Ventilate the area.
Vapors may travel to areas away from work site before igniting/flashing back to vapor source.
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 evaporates readily. Discharge into the environment must be avoided.
Methods and materials for containment and cleaning up	:	Use explosion-proof equipment. No sparking tools should be used. Ventilate the area. Allow to evaporate.

SECTION 7. HANDLING AND STORAGE

Handling

Precautions for safe handling	:	Handle with care. Wear personal protective equipment. Do not breathe vapour. Avoid contact with skin, eyes and clothing. Use only in well-ventilated areas. Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C. Follow all standard safety precautions for handling and use of compressed gas cylinders. Use authorized cylinders only. Protect cylinders from physical damage. Do not puncture or drop cylinders, expose them to open flame or excessive heat. Do not remove screw cap until immediately ready for use. Always replace cap after use.
Advice on protection against fire and explosion	:	Container hazardous when empty. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. Keep product and empty container away from heat and sources of ignition. Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Take measures to prevent the build up of electrostatic charge.

Electrical equipment should be protected to the appropriate standard.
Use explosion-proof equipment.
No sparking tools should be used.
No smoking.

Storage

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

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective measures	:	Ensure that eyewash stations and safety showers are close to the workstation location. Do not breathe vapour. Avoid contact with skin, eyes and clothing.
Engineering measures	:	Use with local exhaust ventilation.
Eye protection	:	Safety goggles
Hand protection	:	Protective gloves Gloves must be inspected prior to use. Replace when worn.
Skin and body protection	:	Avoid skin contact with leaking liquid (danger of frostbite). Wear suitable protective equipment.
Respiratory protection	:	No personal respiratory protective equipment normally required. When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

Use NIOSH approved respiratory protection.

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice.
Ensure adequate ventilation, especially in confined areas.
When using do not eat, drink or smoke.
Remove and wash contaminated clothing before re-use.
Keep working clothes separately.
Do not breathe vapour.
Avoid contact with skin, eyes and clothing.

Exposure Guidelines

Components	CAS-No.	Value	Control parameters	Update	Basis
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, as amended
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.
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, as amended
Difluoromethane	75-10-5	TWA : Time weighted average	(1,000 ppm)	1994	Honeywell:Limit established by Honeywell International Inc.

Carbon dioxide	124-38-9	TWA : Time weighted average	(5,000 ppm)	2008	ACGIH:US. ACGIH Threshold Limit Values, as amended

Carbon dioxide	124-38-9	STEL : Short term exposure limit	(30,000 ppm)	2008	ACGIH:US. ACGIH Threshold Limit Values, as amended

Carbon dioxide	124-38-9	REL : Recommended exposure limit (REL):	9,000 mg/m3 (5,000 ppm)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards, as amended

Carbon dioxide	124-38-9	STEL : Short term exposure limit	54,000 mg/m3 (30,000 ppm)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards, as amended

Carbon dioxide	124-38-9	PEL : Permissible exposure limit	9,000 mg/m3 (5,000 ppm)	02 2006	OSHA_TRANS:US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000), as amended

Carbon dioxide	124-38-9	STEL : Short term exposure limit	54,000 mg/m3 (30,000 ppm)	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000), as amended

Carbon dioxide	124-38-9	TWA : Time weighted average	18,000 mg/m3 (10,000 ppm)	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000), as amended

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	:	Liquefied gas
Color	:	clear
Odor	:	slight
Odor threshold	:	Note: No data available
pH	:	Note: Not applicable
Melting point/range	:	Note: No data available
Boiling point/boiling range	:	Note: No data available
Flash point	:	Note: Not applicable
Evaporation rate	:	Note: No data available
Lower flammability limit	:	11.8 %(V) at 23 °C
Upper flammability limit	:	12.9 %(V) at 23 °C
Vapor pressure	:	1,235 kPa at 21.1 °C(70.0 °F) 2,638 kPa at 54.4 °C(129.9 °F)
Vapor density	:	Note: No data available

Density	:	Note: No data available
Water solubility	:	Note: No data available
Partition coefficient: n-octanol/water	:	Note: No data available
Ignition temperature	:	473 - 477 °C
Viscosity, dynamic	:	Note: No data available
Viscosity, kinematic	:	Note: No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Not classified as a reactivity hazard.
Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	Hazardous polymerisation does not occur.
Conditions to avoid	:	Keep away from heat and sources of ignition. Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Decomposes under high temperature. Some risk may be expected of corrosive and toxic decomposition products.
Incompatible materials	:	Strong oxidizing agents Finely divided aluminium Finely divided magnesium Zinc

Hazardous decomposition products	:	Hydrogen fluoride Carbonyl halides Carbon monoxide Carbon dioxide (CO2)

SECTION 11. TOXICOLOGICAL INFORMATION

Acute inhalation toxicity 2,3,3,3-Tetrafluoroprop-1-ene	:	LC50: > 400000 ppm Exposure time: 4 h Species: Rat Method: OECD Test Guideline 403
Difluoromethane	:	LC50: > 520000 ppm Exposure time: 4 h Species: Rat
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 2,3,3,3-Tetrafluoroprop-1-ene	:	Dermal Note: Not applicable, as this product is a gas. study technically not feasible
Difluoromethane	:	Cardiac sensitization Species: dogs Note: No-observed-effect level >350 000 ppm

Repeated dose 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
Difluoromethane	:	Species: Rat Application Route: Inhalation Exposure time: (90 d) NOEL: 50000 ppm

Subchronic toxicity

Genotoxicity in vitro		
2,3,3,3-Tetrafluoroprop-1-ene	:	Test Method: Ames test Result: 20% and higher, positive in TA 100 and e. coli WP2 uvrA, negative in TA98, TA100, and TA1535. Method: OECD Test Guideline 471
Difluoromethane	:	Test Method: Ames test Result: negative
	:	Test Method: Chromosome aberration test in vitro Cell type: Human lymphocytes Result: negative Method: OECD Test Guideline 473 Note: Dose 760,000 ppm
	:	Cell type: Human lymphocytes Result: negative Method: Mutagenicity (in vitro mammalian cytogenetic test)
	:	Test Method: Chromosome aberration test in vitro Result: negative
Genotoxicity in vivo		
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
Difluoromethane	:	Species: Mouse Cell type: Bone marrow

Method: Mutagenicity (micronucleus test)
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.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Toxicity to fish : LC50: > 197 mg/l
Exposure time: 96 h
Species: Cyprinus carpio (Carp)
Test substance: 2,3,3,3-Tetrafluoroprop-1-ene

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
2,3,3,3-Tetrafluoroprop-1-ene : Result: Not readily biodegradable.
Method: OECD Test Guideline 301F

Difluoromethane : Note: Minimal

Further information on ecology

Additional ecological information : Accumulation in aquatic organisms is unlikely.
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.

SECTION 14. TRANSPORT INFORMATION

DOT

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

	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. (R-1234yf, DIFLUOROMETHANE)
	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. Inventory of Chemicals and Chemical Substances (PICCS)	:	On the inventory, or in compliance with the inventory
China. Inventory of Existing Chemical Substances (IECSC)	:	On the inventory, or in compliance with the inventory
New Zealand. Inventory of	:	On the inventory, or in compliance with the inventory

Chemicals (NZIoC), as published by ERMA New Zealand

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 : Carbon dioxide 124-38-9
: Dichloromethane 75-09-2

New Jersey RTK : Carbon dioxide 124-38-9

Pennsylvania RTK : Difluoromethane 75-10-5

	:	Carbon dioxide	124-38-9

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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Prepared by Honeywell Performance Materials and Technologies Product Stewardship Group