SOLSTICE® GAS BLOWING AGENT

Technical Information

Solstice

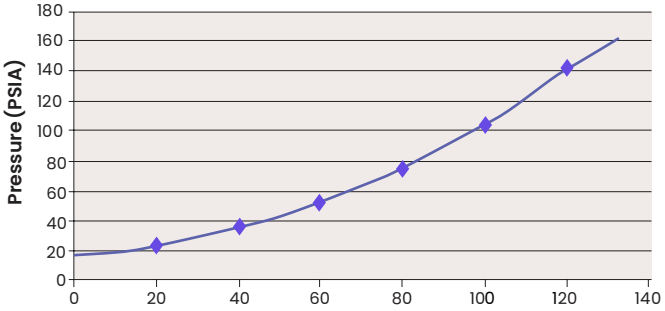
Solstice® Gas Blowing Agent Technical Data

Solstice® Gas Blowing Agent (GBA) is the tradename for trans-1,3,3,3-tetrafluoropropene, also known as HFO-1234ze(E). Solstice® GBA has been developed for extruded polystyrene and pressurized one-and two-component polyurethane foams and other foams where gaseous blowing agents are used. It is a replace-ment for HFC-134a, CO_2, 152a, and other fluorocarbon and non-fluorocarbon foam blowing agents.

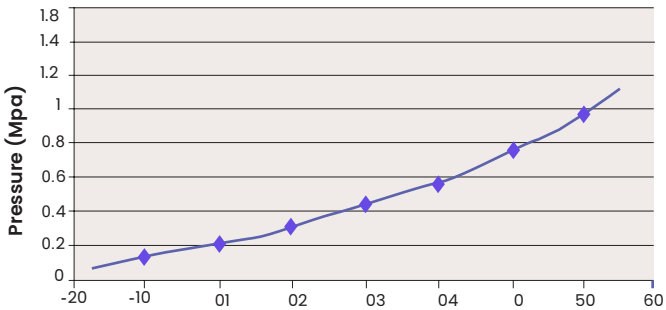
Specification	Limit
Assay as trans - 1,3,3,3-tetrafluripropene	99.5 wt. % minimum
Moisture	0.0050 wt. %maximum
Acidity as HCL as mg KOH/gm	0.0001 wt % maximum 0.0015, maximum
Non-volatile residue	0.0050 wt. % maximum

Specification	Limit		
Molecule name	trans – 1,3,3,3-tetrafluoroprop-1-ene		
CAS #	29118-24-9		
ELINCS # (EU)	471–480–0		
Formula	(E)CHF=CHCF3		
Molecular Weight	114		
Boiling Point	- 2.2°F / - 19°C		
Vapor Pressure @ 70°F / 21°C	49 psig / 3.4 bars		
Vapor Pressure @ 130°F / 54°C	147 psig / 10.1 bars		
Liquid Density @ 70°F / 21°C	1.17 g/cm³		
Heatof Vaporization @ normal boiling point	84 BTU/lb	195 kJ/kg	22.2kJ/mole
Solubility of Water in Solstice GBA @ 68°F/20°C	225 ppm		
Solubility of Solstice GBA in Water @ 68°F/20°C	373 ppm		
Vapor Thermal Conductivity	13.0 mW/m•°K(@25°C)		
Flame Limits - EC Testing Method A11: Flammability of Gases	None to 82.4°F/28°C		
Flashpoint	N/A Method: ISO 2719		
Exposure Level (AIHA WEEL– 8hr TWA)	800 ppm		
Ozone Depletion Potential	Non-ozone-depleting		
Global Warming Potential, 100 year time horizon	<1		
Volatile Organic Compoun (VOC) Status	U.S.EPA – Exempt	POCP less than ethane	

Vapor Pressure vs. Temperature – English Units



Vapor Pressure vs. Temperature – Metric Units



Material Compatibility

Solstice® GBA is non-reactive and non-corrosive toward all commonly used metals in polyurethane processing equipment. This includes carbon steel, stainless steel, copper and brass.

There is a concern with use of aluminum in contact with any halogenated material, which includes Solstice GBA, due to the reactive nature of aluminum–particularly if aluminum fines are present. This is especially true if the oxide layer on the surface of the aluminum is removed.

In general, Solstice GBA is similar in compatibility toward plastics and elastomers as HFC-134a. Gaskets and seals that were changed to accommodate HFC-134a should be compatible with Solstice GBA. In most situations, PTFE is the recommended seal and gasket material.

The final determination of suitability for use is the responsibility of the end user.

Health, Safety, and Enviromental

Flammability

Solstice GBA is a non-flammable gas by test methods ASTM E-681, and by EU Test method A-11. Flammability characterization was performed by Chilworth Technologies Ltd – UK, with the finding, "It has been concluded beyond reasonable doubt that the material(Solstice HFO-1234ze blowing agent) will not possess oxidizing or explosive properties. It should be noted that flammability characterization and flammability regulations for gaseous materials are evaluated at room temperature, 21°C.

Solstice GBA exhibits narrow vapor flame limits at temperatures above 28°C. At 30°C, it exhibits flame limits LEL/UEL at 7.0/9.5 volume percent in air. Product is also used widely in Japan.

Further investigation into the flammability characterization of Solstice GBA has yielded evidence that even at elevated temperatures (60°C), the minimum ignition energy is significantly high – 61,000mJ. This is several orders of magnitude higher than other commonly used low GWP blowing agents, such as hydrocarbons, meaning that Solstice GBA is very difficult to ignite even at 60°C. Safe handling and use in processes utilizing this, as well as any other halogenated materials include: avoidance of fire, open flame, smoking, and hot surfaces in the vicinity of these materials.

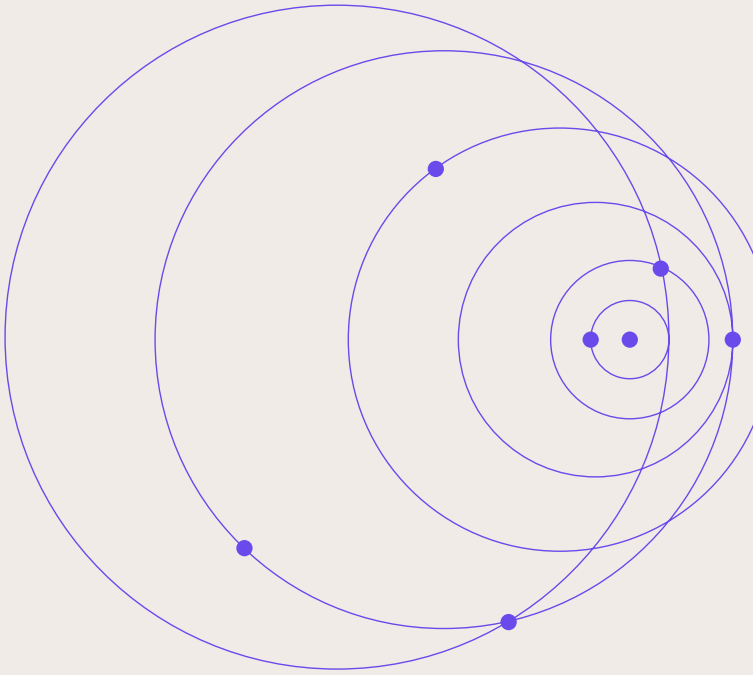
The material safety data sheet (MSDS) for Solstice GBA (HFO-1234ze(E)) contains comprehensive and the most current detail for the health, safety and environmental aspects and considerations.

Toxicity

The American Industrial Hygiene Association has assigned a Workplace Environmental Exposure Level (WEEL) of 800PPM (8-hour time weighted average) to this material .It was found not to be an irritant in a human skin sensitization study.

Packing and Storage

Solstice GBA is categorized as a "liquefied gases under pressure." It is a moderate pressure gas, and containers (bulk storage tanks or packages) should be pressure-rated to 1725 kPa (250 psig). Approved packages (containers), should be stored in a cool, well-ventilated area. Do not puncture or expose to open flames, excessive heat or direct sunlight. Solstice GBA should not be mixed with oxygen or air at elevated pressures. Applications necessitating pressurization should use dry nitrogen. If an inert atmosphere is required on a vessel, Solstice recommends that dry nitrogen be utilized. Air must not be used .Check local code requirements to ensure compliance.



RESPONSIBLE CARE
OUR COMMITMENT TO SUSTAINABILITY

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