

Solstice® Propellant Storage and Handling Guide

Physical Properties

Solstice® Propellant (also known as HFO-1234ze or Solstice® 1234ze) is a nonflammable, liquefied gas propellant that is shipped and stored under pressure. A summary of Solstice Propellant’s physical properties is shown in **Table 1**. Vapor pressures and liquid densities over a range of temperatures for the product are shown in **Table 2**. At temperatures below the boiling point of Solstice Propellant, which is -2.2°F, storage vessels will be under partial vacuum.

Note: Pressures are in pounds per square inch (PSI) absolute.

Table 1	
Chemical Formula	<i>Trans</i> CHF=CHCF ₃
CAS Number	29118-24-9
Molecular Weight	114
Boiling Point (°F)	-2.2
Vapor Pressure @ 70° F (PSIA)	64
Vapor Pressure @ 130° F (PSIA)	162
Liquid Density @ 70° F (pounds/gallon)	9.8
Vapor Flame Limits @ 70° F (by ASTM E-681)	None
Heat of Combustion	4385 BTU/pound (10.2 kilojoules/gram)
Solubility in Water @ 70° F (% by Weight)	0.037
Solubility of Water @ 70° F (% by Weight)	0.022

Table 2		
Temperature (°F)	Vapor Pressure (PSIA)	Liquid Density (pounds/gallon)
-20	9.4	11.0
-10	12.1	10.9
0	15.5	10.8
10	19.5	10.6
20	24.4	10.5
30	30.1	10.4
40	36.9	10.2
50	44.7	10.1
60	53.8	10.0
70	64.2	9.8
80	76	9.7
90	89.4	9.5
100	105	9.3
110	122	9.2
120	141	9.0
130	162	8.8

Materials Compatibility

Solstice Propellant is compatible with commonly-used metals, including carbon steel, stainless steel, copper and brass. Although Solstice Propellant has been shown to be compatible with aluminum in thermal stability tests, exposure to finely divided aluminum or freshly abraded aluminum surfaces should be avoided.

Preferred gasket materials for use with Solstice Propellant are PTFE and PTFE-encapsulated DuPont™ Viton®. Solstice Propellant has been found to be generally compatible with grades of buna and butyl rubbers and DuPont™ Neoprene®. However, because results may vary with different grades and manufacturers of a particular elastomer, it is recommended that you confirm compatibility. Tests have shown that Solstice Propellant is compatible with most plastics, except acrylics.

Thermal and Hydrolytic Stability

Solstice Propellant has been shown to be thermally stable when tested at 392°F (200°C) for two weeks. Although Solstice Propellant does not readily mix with water, it is stable in the presence of water.

Exposure Limits

Solstice Propellant has undergone extensive toxicity testing, including acute exposure, repeat exposure, genetic toxicity and developmental toxicity studies. The results of these tests show that the product exhibits a very low order of toxicity. Honeywell has set an occupational exposure limit (OEL) of 800 parts per million (PPM) (eight-hour time weighted average) for Solstice Propellant. Similarly, the American Industrial Hygiene Association has set a Workplace Environmental Exposure Level

(WEEL) of 800 PPM (eight-hour time weighted average) for this product. Solstice Propellant does not pose an acute or chronic workplace exposure hazard when exposure concentrations are maintained below these recommended levels.

Flammability

Solstice Propellant is classified as UN3163, liquefied gas, n.o.s., which is a Class 2.2 non-flammable gas. The flammability determination is based on testing by ASTM E-681 and ISO 10156 standards that found that Solstice Propellant does not exhibit vapor flame limits (a flammable range) under test conditions. It has also been tested by EC testing method A11 (flammability of gases), and has been found to be nonflammable. Solstice Propellant is non-flammable by U.S. Department of Transportation (DOT), International Air Transport Association (IATA), International Maritime Dangerous Goods (IMDG) and Globally Harmonized System (GHS) definitions. Solstice Propellant does not meet the National Fire Protection Association (NFPA) definition of a flammable gas or flammable liquefied gas found in NFPA 55.

At elevated temperatures (approximately 86°F and greater), Solstice Propellant can exhibit vapor flame limits, especially at high relative humidity. At 86°F, the lower limit is approximately 7% volume in air. If specific operating conditions are such that high concentrations of Solstice Propellant can accumulate in areas at high temperature and relative humidity, and in the presence of high-energy electrical discharges or other ignition sources, additional measures such as temperature and humidity control, increased ventilation or coded electrical equipment (class one, division two) may be warranted.

Bulk Storage

Solstice Propellant should be handled in a manner consistent with materials categorized as liquefied gases under pressure. Generally, any storage vessel that is appropriate for HFC-134a will be suitable for Solstice Propellant as long as the gaskets and seals are compatible. Preferred gasket materials are PTFE and PTFE-encapsulated DuPont™ Viton®.

Solstice Propellant Bulk Storage Recommendations

- Tanks should be of carbon steel construction
- Tank design pressure should be adequate for Solstice Propellant (180 PSIG minimum, 200 PSIG preferred)
- An appropriately-sized pressure relief valve should be installed on the tank
- Excess flow valves should be installed on all liquid and vapor openings that are connected to product transfer piping
- Tanks should be rated for full vacuum
- Indoor bulk storage vessels should not be used
- Keep flammable chemicals and other combustibles away from storage vessels

ISO Containers

Bulk quantities of Solstice Propellant may be delivered in ISO containers mounted on a chassis. They do not have onboard transfer pumps or transfer hoses. These pumps or hoses must be supplied by the user. Transfer hoses are connected to the ISO containers with LP gas hose filler couplings (female ACME X MNPT). The liquid outlet takes a 3.5 inch ACME coupling with a 2 inch NPT discharge. The vapor outlet takes a 1.75 inch ACME coupling with a 1 inch NPT discharge.

Cylinders

Solstice Propellant may be delivered in ton and half-ton cylinders. Ton cylinders are oriented horizontally during use. Half-tons are oriented vertically for use. The valve connections on both are 1 inch CGA 660. Containers of Solstice Propellant should be stored in a cool, well-ventilated area. Containers should not be punctured, dropped or exposed to open flames, excessive heat or direct sunlight. Container valves should be tightly closed after use and when the container is empty.

Pumps

Any pump that is suitable for use with other liquefied gas propellants or refrigerants will be suitable for Solstice Propellant. Honeywell facilities use multi-stage centrifugal side channel pumps. Regenerative turbine pumps are also acceptable.

Transfer Hoses

Transfer hoses should be PTFE-lined and rated for the pressure of Solstice Propellant. A smooth bore PTFE-lined rubber covered hose or a PTFE-lined braided stainless steel hose would also be acceptable choices.

To learn more about Solstice Propellant, or to contact our technical and sales teams, please visit www.honeywell-solstice-propellant.com.

The statements contained herein are intended to provide general guidelines for storage and handling of Solstice® Propellant. It is not possible to anticipate and address potential conversion requirements in all facilities under all possible circumstances. Although all statements and information contained herein are believed to be accurate and reliable, they are presented without guarantee or warranty of any kind, expressed or implied. Information provided herein does not relieve the user from the responsibility of carrying out its own tests and experiments, and the user assumes all risks and liability for use of the information and results obtained. Statements or suggestions concerning the use of materials and processes are made without representation or warranty that any such use is free of patent infringement and are not recommendations to infringe any patent. The user should not assume that all toxicity data and safety measures are indicated herein or that other measures may not be required.

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