

Vertrel™ SFR

Specialty Fluid

Lead Free and No Clean Flux Removal

Technical Information

Introduction

Vertrel™ SFR is an engineered mixture of nonflammable hydrofluorocarbons (HFCs), trans-1,2-dichloroethylene (t-DCE) and methanol.

Vertrel™ SFR is designed to remove difficult to remove high temperature fluxes used in lead free and no clean solders. It has excellent solvency power for a wide range of soils, including ionic soils. The low surface tension and non-flammable properties of Vertrel™ SFR make it an ideal ultrasonic vapor degreasing solvent.

Vertrel™ SFR is a non-ozone depleter and can replace many solvents, such as trichloroethylene (TCE), n-propyl bromide (nPB), HCFC-225 blends, HCFC-141b, HFEs, PFCs, and CFCs. Vertrel™ SFR can also replace aqueous cleaners where floor space and cleanliness are at a premium.

Features and Benefits

Vertrel™ SFR does a good job balancing performance with favorable environmental and worker safety properties.

- Excellent solvency power (Kb value >100) to remove organic and ionic contaminants: Superior cleaning performance
- Fast drying: Increases productivity
- Low surface tension: Able to penetrate and clean tight areas
- Compatible with most plastics, elastomers, and metals
- Can be used with ultrasonics
- Nonflammable

- Low toxicity
- Zero ozone depletion potential (ODP)
- Low global warming potential (GWP)
- Existing equipment can be used with minor or no modification
- No surfactants needed: Residue free cleaning is promoted.

Typical Applications

- Defluxing
- Oil, grease, and wax removal
- Precision cleaning

Specification Conformity Tests

Vertrel™ SFR has been tested in a variety of industry tests, including:

Boeing D6-17487 Revision P

Solvent Cleaners; General Cleaning

ARP 1755 B

Effect of Cleaning Agent on Aircraft Engine Materials

Douglas Aircraft Company

Type 1: Materials and Procedures for General Exterior Cleaning of Painted and Unpainted Surfaces (General Purpose Cleaner)

Environmental Properties

Vertrel™ SFR has zero ozone depletion potential and low global warming potential. See **Table 1** for various environmental properties of Vertrel™ SFR. Vertrel™ SFR is accepted by the U.S. Environmental Protection Agency (EPA) under the Significant New Alternatives Policy (SNAP) program as a substitute for ozone-depleting substances (solvent category). It is not SNAP approved for aerosol packages.



Table 1. Environmental Properties

Property	Vertrel™ SFR
Ozone Depletion Potential (ODP)	0
Global Warming Potential (GWP/100 yr ITH)*	264
Volatile Organic Compounds (VOC, g/L)	1,063

*IPCC Second Assessment Report (1995)

Refer to the Safety Data Sheet (SDS) for regulatory information.

Table 2. Physical Properties

Property	Vertrel™ SFR	HCFC-225 ca/cb	TCE	nPB	CFC-113	HCFC-141b
Boiling Point, °C (°F)	41 (106)	54 (129)	87 (189)	71 (160)	48 (118)	32 (90)
Freezing Point, °C (°F)	<-50 (<-58)	-131 (-204)	-86 (-123)	<-76 (<-105)	-35 (-31)	-103.5 (-154.3)
Liquid Density, kg/L (lb/gal)	1.28 (10.7)	1.55 (12.9)	1.46 (12.15)	1.35 (11.26)	1.56 (13.06)	1.23 (10.26)
Surface Tension at 25 °C, N/m (dyn/cm)	0.0199 (19.9)	0.0162 (16.2)	0.0323 (32.3)	0.0259 (25.9)	0.1073 (17.3)	0.0193 (19.3)
Viscosity at 25 °C (77 °F), cP	0.58	0.59	0.54	0.49	0.47	0.43
Vapor Pressure at 25 °C (77 °F)						
kPa	57.9	38.5	9.9	20.3	44.5	76.9
atm	0.57	0.38	0.099	0.20	0.44	0.75
psia	8.4	5.6	1.4	2.9	6.46	11.15
Heat of Vaporization at Boiling Point, kJ/kg (cal/g)	285 (68)	146 (35)	237.9 (56)	248.0 (58.8)	148 (35)	225 (53.2)
Heat Capacity at 20 °C (77 °F), kJ/kg·°C (Btu/lb·°F)	1.16 (0.28)	1.2(0.29)	0.87 (0.21)	-	0.87 (0.21)	1.41 (0.34)
Kb Value	101	31	129	125	37	56

Safety/Flammability/Storage

Data from acute toxicity studies has demonstrated that Vertrel™ SFR has low toxicity. It has a calculated Acceptable Exposure Limit (AEL) of 193 ppm based on its individual components. AEL is an airborne inhalation exposure limit established by Chemours that specifies time-weighted average (TWA) concentrations to which nearly all workers may be repeatedly exposed without adverse effects. The calculated AEL is in accordance with ACGIH formulas for TLVs for mixtures. Vertrel™ SFR is a slight skin and eye irritant and has low acute inhalation toxicity.

Please refer to the SDS for information on detailed exposure limits and toxicity-related data.

Vertrel™ SFR exhibits no closed cup or open cup flash point and is not classified as a flammable liquid by NFPA or DOT. The product is volatile, and if allowed to evaporate and mix with air, the vapor may become flammable. Flash point data and vapor flammability limits in air are shown in **Table 3**.

Table 3. Flammable Properties

Property	Test Method	Vertrel™ SFR
Closed Cup Flash Point	ASTM D93	None
Open Cup Flash Point	ASTM D1310	None
Vapor Flammability in Air Lower Explosivity Limit Upper Explosivity Limit	ASTM E681	7 vol% in air 15 vol% in air

Vertrel™ SFR is thermally stable and does not oxidize or degrade during storage. Store in a clean, dry area. Protect from freezing temperatures. If solvent is stored below -10 °C (14 °F), mix prior to use. Do not allow stored product to exceed 52 °C (125 °F) to prevent leakage or potential rupture of container from pressure and expansion.

Disposal and Recovery of Spent Solvent

Please read SDS and discuss disposal options with a knowledgeable Chemours or distributor representative prior to disposal or recovery. The presence of high concentrations of certain soils (such as petroleum-based lubricating oils) may affect the flammability characteristics of the material during disposal and/or recovery operations. Users should test for flammability in their particular application and test the spent Vertrel™ SFR to ensure proper classification for waste disposal.

Material Compatibility

Most metals, plastics, and elastomers commonly used for components mounted on printed wiring board assemblies can be safely cleaned with Vertrel™ SFR. Plastics that may show signs of softening, swelling, or other changes include acrylics, ABS, and polycarbonate. Elastomers, if affected, will generally revert to within a few percent of original size after air-drying. Prior to use, testing of plastics and elastomers should be performed under conditions expected during normal operation (e.g., time in contact with Vertrel™ SFR, temperature, etc.). For more information on material compatibility, contact Chemours or a Vertrel™ distributor.

Contact with highly basic materials, pH 10 and above, is not recommended.

Large amounts of water may extract the alcohol component of Vertrel™ SFR and reduce cleaning performance. Therefore, to reduce alcohol loss, use desiccant dryers, rather than water separators, in the condensate return line.

Product Description, Packaging, and Availability

Table 4. Vertrel™ SFR Composition (Typical)

Property	Vertrel™ SFR
Hydrofluorocarbon mixture, wt%	28-32
Trans-1,2-dichloroethylene, wt%	66-70
Methanol	< 3 wt%
Water, ppm	<200
Nonvolatile Residue, ppm	<10 (drums) or <50 (pails)
Appearance	Clear, colorless

Vertrel™ SFR is available commercially in 55-gal (208-L) drums with a net weight of 500 lb (227 kg) and in 5-gal (19-L) pails with a net weight of 45 lb (20 kg).

For more information on Vertrel™, please visit vertrel.com or call (800) 235-7882.

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