DuPont™ Vertrel® MCA

SPECIALTY FLUID

Technical Information

Precision Cleaning

Introduction

DuPont™ Vertrel® MCA is a proprietary azeotrope of DuPont™ Vertrel® XF hydrofluorocarbon (2,3-dihydrodecafluoropentane) with trans-1,2-dichloroethylene. It is ideally suited for use in vapor degreasing equipment. Its enhanced solvency power, compared to DuPont™ Vertrel® XF alone, makes it particularly effective for precision and specialty cleaning with difficult soils.

DuPont™ Vertrel® MCA has "zero" ozone-depletion potential, and low global warming potential. It can replace CFC-113, methyl chloroform (1,1,1-TCA), hydrochlorofluorocarbons (HCFCs), and perfluorocarbons (PFCs) in many applications. DuPont™ Vertrel® MCA 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.

Physical properties of DuPont™ Vertrel® MCA are shown in **Tables 1** and **2**.

Table 1
Physical Properties

Property[a]	DuPont™ Vertrel® MCA	CFC-113
Molecular Weight	157	187
Boiling Point, °C (°F)	39 (102)	47.6 (117.6)
Liquid Density, kg/l	1.41	1.56
Vapor Pressure, atm	0.610	TBD
Surface Tension, N/m	0.0152	TBD
Freezing Point, °C (°F)	<–50 (<–58)	–35 (–31)
Solubility of Water, wt%	0.065	0.011
Heat of Vaporization at Boiling Point, kJ/kg	181.2	TBD
Heat Capacity, kJ/kg•°C	1.13	TBD
Viscosity, cPs	0.49	0.68
Flash Point		
Closed Cup[b]	None	None
Open Cup[c]	None	None
Vapor Flammability in Air, vol%		
Lower Limit	None	None
Upper Limit	None	None

[a] At 25°C (77°F) except where indicated.
[b] Pensky-Martens Closed Cup Tester (ASTM D 93)
[c] Tag Open Cup Tester (ASTM D 1310)

Table 2
Density and Vapor Pressure Change with Temperature

Temperature, °C (°F)	Density, kg/l	Vapor Pressure, atm
0 (32)	1.47	0.213
10 (50)	1.44	0.339
20 (68)	1.42	0.493
25 (77)	1.41	0.587
30 (86)	1.39	0.726
40 (104)	1.37	1.046
50 (122)	1.35	1.462
60 (140)	1.33	1.985

Cleaning Process

Vapor degreasing should be used for optimum cleaning effectiveness and economy. Modern vapor containment technology is recommended for both batch and in-line equipment. These systems have higher freeboard and a secondary set of low-temperature (–29°C [–20°F]) condenser coils to reduce vapor loss.

DuPont™ Vertrel® MCA has a broad range of cleaning capabilities. **Table 3** lists some typical soils readily removed from parts in a short vapor degreasing cycle.

Table 3
Soils Cleaned with DuPont™ Vertrel® MCA

Cutting Oils	Stamping Oils
Gear Oils	Vacuum Oils
Heavy Greases	Waxes
Hydraulic Oils	Mineral Oils

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Plastic and Elastomer Compatibility

DuPont™ Vertrel® MCA is compatible with most polymeric materials commonly encountered in degreasing of precision parts. Acrylic, ABS, and polycarbonate parts, particularly if under stress, may show slight cracking or crazing damage and should be tested. EPDM, butyl rubber, Buna-S, and neoprene are recommended for elastomeric parts.

Tables 4 and **5** summarize test results on short-term exposures of unstressed plastics and elastomers simulating a typical cleaning cycle. Long-term compatibility data simulating exposure of vapor degreaser construction materials is available from DuPont upon request.

Elastomer swelling and shrinking will, in most cases, revert to within a few percent of original size after air drying. Swell, shrinkage, and extractables are strongly affected by the compounding agents, plasticizers, and curing used in the manufacture of plastics and elastomers. Therefore, prior in-use testing is particularly important.

Table 4
Plastic Compatibility
Immersion: 15 Minutes at Room Temperature

Compatible	
Polyethylene	Acetal
Polyvinylchloride	Epoxy
Polyester, PET, PBT	Liquid Crystal Polymer
Polyimide, PI, PEI, PAI	Phenolic
Polyetherketone, PEK	PTFE, ETFE
Polyaryletherketone, PEEK	Chlorinated PVC
Polyarylsulfone, PAS	Ionomer
Polypropylene	ABS
Polyphenylene Sulfide, PPS	Polysulfone, PSO
Incompatible[a]	
Polystyrene	Acrylic
Polyphenylene Oxide, PPO	Cellulosic

[a] Material composition varies depending upon compounding agents, plasticizers, processing, etc. Specific materials should be tested for compatibility with solvent.

Table 5
Elastomer Compatibility
Immersion: 1 Week at 39°C

Compatible	
Polysulfide (Thiokol FA)	EPDM (Nordel®)
Chlorosulfonated PE	Butyl Rubber*
Neoprene*	
Require Additional Testing	
Buna-N	Polychloroprene
Urenethane	Silicone
Buna-S*	Natural Rubber
Fluoroelastomers	

* Swelling, but with low extractables.

Metals and Other Compatibility

DuPont™ Vertrel® MCA was found compatible with aluminum, copper, and iron, with and without oil present, after exposure for 2 weeks at 120°C (248°F) in sealed tubes.

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

Exposure Limits

Data from acute toxicity studies has demonstrated that DuPont™ Vertrel® MCA has low toxicity. It is a slight skin and eye irritant and has low inhalation toxicity. **Table 6** shows the applicable exposure limits for the component materials of DuPont™ Vertrel® MCA.

AEL and TLV limits are time weighted average (TWA) concentrations for a normal 8- or 12-hr workday and a 40-hr workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect. Please refer to the Material Safety Data Sheet for additional details.

Table 6
Exposure Limits

Component	Limit, ppm		Type
DuPont™ Vertrel® XF	AEL[a]	200	8- and 12-hr TWA
		400	Ceiling[b]
Trans-1,2-dichloroethylene	TLV[c]	200	8-hr TWA
DuPont™ Vertrel® MCA	AEL[a, b]	200	Calculated[d]

[a] AEL (Acceptable Exposure Limit) is an airborne inhalation exposure limit established by DuPont that specifies time-weighted average concentrations to which nearly all workers may be repeatedly exposed without adverse effects.

[b] A ceiling limit is the concentration that should not be exceeded during any part of the working day. The ceiling limit for individual components applies to the blend product as well.

[c] TLV (Threshold Limit Value) is an air-borne inhalation exposure limit established by the American Conference of Government and Industrial Hygienists (ACGIH) that specifies time-weighted average concentrations to which nearly all workers may be repeatedly exposed without adverse effects.

[d] Calculated in accordance with ACGIH formula for TLVs for mixtures.

Safety/Flammability

DuPont™ Vertrel® MCA exhibits no closed cup or open cup flash point, and is not classified as a flammable liquid by NFPA or DOT. In addition, the product has no vapor flammability limits in air.

Flash point data and limits of flammability in air provide the user with additional information that should be used as elements of a fire risk assessment and to determine guidelines for the safe handling of volatile chemicals. Users should assure compliance with NFPA standards and local fire codes.

Recovery

Due to the azeotropic nature of DuPont™ Vertrel® MCA, the product is easily recoverable by off-line or in-line distillation equipment such as a vapor degreaser or still. The presence of soil, however, may alter the characteristics of the material during the recovery operation. Recovery should be closely monitored to ensure operating levels are maintained. Users should test the spent DuPont™ Vertrel® MCA to ensure proper classification for waste disposal.

Storage/Handling

DuPont™ Vertrel® MCA 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.

Consideration should be given to retrofit of existing, or purchase of new, vapor degreasing equipment to provide vapor containment technology that enables safe and economical use of DuPont™ Vertrel® MCA.

Drum pumps are recommended to dispense DuPont™ Vertrel® MCA from its container. Refer to the Material Safety Data Sheet for specific handling precautions and instructions.

Environmental Legislation

DuPont™ Vertrel® specialty fluids have "zero" ozone-depletion potential and low global warming potential **(Table 7)**. They are used as alternatives to CFC-113, methylchloroform, hydrochlorofluorocarbons (HCFCs), and perfluorocarbons (PFCs) in many critical cleaning, drying, carrier fluid, and other high-value specialty uses where reliability is paramount.

DuPont™ Vertrel® MCA 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.

The components of DuPont™ Vertrel® MCA are listed in the TSCA inventory. One component, HFC-43-10mee, is subject to the Significant New Use Rule (SNUR) and should be used only in the indicated applications. See MSDS Regulatory Section.

DuPont™ Vertrel® MCA is not a hazardous air pollutant (HAP), and therefore, not subject to NESHAP regulation. DuPont™ Vertrel® MCA is not included in the SARA Title III Section 313 list of toxic chemicals, and is not subject to SARA Title III (EPCRA) reporting requirements.

Table 7
Environmental Properties

Property	DuPont™ Vertrel® MCA
Ozone-Depletion Potential (ODP)	0
Global Warming Potential (GWP/100 yr ITH)*	806
Volatile Organic Compounds (VOC, g/L)	536

* IPCC Second Assessment Report (1995)

Packaging and Availability

DuPont™ Vertrel® MCA is available commercially in 55-gal (208-L) drums with a net weight of 550 lb (249 kg) and in 5-gal (19-L) pails with a net weight of 50 lb (23 kg). One-gallon and smaller samples in glass containers are available on request. Customers are encouraged to secure samples now for compatibility and performance testing.

Specifications

Composition and specifications are shown in **Table 8**. All components are listed in the TSCA Inventory.

Table 8
DuPont™ Vertrel® MCA Specifications

DuPont™ Vertrel® XF, wt%	62.0 ± 1.0
Trans-1,2-dichloroethylene, wt%	38.0 ± 1.0
Total Purity, wt%	99.8 min.
Nonvolatile Residue, ppm wt	10 max.*
Moisture, ppm wt	100 max.
Acidity (as HCl), ppm wt	1.0 max.
Chloride, ppm wt	1.0 max.
Particle Count, mg/L	2.0 max.
Appearance	Clear, colorless

*50 ppm max. in 5-gal/19 liter pails.

If you are interested in purchasing or finding out more about DuPont™ Vertrel® please use the list below to contact the DuPont office closest to you.

North America

DuPont Fluorochemicals
Customer Service Center
Chestnut Run Plaza 702
Wilmington, DE 19880-0702
Ph: 800-969-4758 (U.S. only)
Ph: 1-302-774-1160 (Outside U.S.)

Europe, Middle East, Africa

DuPont de Nemours Intl., S.A.
2, Chemin du Pavilion
CH-1218 Le Grand-Saconnex/GE
Switzerland
Ph: 41 22 717 5296
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Asia Pacific

DuPont-Mitsui Fluorochemicals Co. Ltd.
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