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CMS Specialty Defluxing Solvent

Defluxing
Precision Metal Cleaning
Removes Rosin, Oils, Ionic Contaminants

Introduction

CMS Defluxing Solvent is a patented blend of hydrofluorocarbons Vertrel® XF (2,3-dihydrodecafluoropentane) and HFC-365mfc (1,1,1,3,3-pentafluorobutane) with trans-1,2-dichloroethylene and methanol. It has "zero" ozone depletion potential, and low global warming potential, making it an ideal replacement for HCFC 141b and perfluorocarbons (PFCs) in many applications. All components of CMS Solvent are accepted under the USA EPA's Significant New Alternatives Policy (SNAP).

This product bulletin summarizes product property, application and use, safety, health, environmental, and regulatory information. Users should also consult the Material Safety Data Sheet (MSDS) for additional information.

Physical properties of CMS Solvent are shown in **Table 1** and **2**.

Applications

CMS Solvent is intended for applications to remove rosin-based fluxes from electronic assemblies. It can also be used in applications for precision cleaning of metal or solvent-safe plastic substrates. It is suitable for use in boiling systems such as vapor degreaser systems, due to its excellent compositional stability. Since it has enhanced solvency, compatibility with plastic and elastomeric materials should be checked prior to use.

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.

Table 1
Physical Properties

Property[a]	CMS Solvent
Molecular Weight	125
Boiling Point, °C (°F)	36 (97)
Liquid Density, g/cc (lb/gal)	1.33 (11.1)
Vapor Pressure, mm Hg (psia)	497 (9.6)
Surface Tension, dyn/cm	19.2
Freezing Point, °C (°F)	–27 (–17)
Heat of Vaporization at Boiling Point, cal/g (Btu/lb)	54 (96)
Heat Capacity, cal/g°C (Btu/lb°F)	0.3 (0.3)
Viscosity, cPs	0.58
Flash Point, °C (°F)	
Closed Cup[b]	None
Open Cup[c]	28 (82)
Vapor Flammability in Air, vol%	
Lower Limit	6.25
Upper Limit	14

[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 1310-86)

Table 2
Density and Vapor Pressure Change with Temperature

Temperature, °C (°F)	Density, g/cc (lb/gal)	Vapor Pressure, mmHg (psia)
0 (32)	1.39 (11.6)	166 (3.2)
10 (50)	1.36 (11.4)	264 (5.1)
20 (68)	1.34 (11.2)	405 (7.8)
25 (77)	1.33 (11.1)	497 (9.6)
30 (86)	1.32 (11.0)	601 (11.6)
40 (104)	1.30 (10.8)	866 (16.7)
50 (122)	1.27 (10.6)	1,216 (23.5)
60 (140)	1.25 (10.4)	1,668 (32.3)

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Plastic and Elastomer Compatibility

Most plastics commonly used for components mounted on printed wiring board assemblies can be safely cleaned in CMS Solvent. 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.

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.

Tables 3 and **4** 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 MicroCare upon request.

Table 3
Plastic Compatibility
Immersion: 15 Minutes at Room Temperature

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

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

Table 4
Elastomer Compatibility
Immersion: 15 Minutes at Room Temperature

Compatible	
Buna N, NBR, Nitrile	Buna S, SBR, GRS
Butyl Rubber, IIR	EPM, EPDM, Nordel® Polysulfide
Natural Rubber, Isoprene	Neoprene
Urethane	Viton® B
	Silicone
Incompatible[a]	
Chlorosulfonated PE	

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

Metals and Other Compatibility

CMS Solvent was found compatible with aluminum, copper, and iron, with and without rosin flux present, after exposure for two weeks at 36°C (97°F) in sealed tubes.

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

CMS Solvent is not compatible with strong bases; therefore, contact with highly basic process materials is not recommended.

Safety/Exposure Limits

Users of CMS Solvent must read and understand the MicroCare Material Safety Data Sheet (MSDS). Data from toxicity studies have demonstrated that the components of CMS Solvent have low toxicity and are safe when handled in accordance with MicroCare recommendations and when exposures are maintained below recommended exposure limits.
CMS is a skin and eye irritant and has low acute inhalation toxicity. As with many safely used halocarbon materials, intentional misuse or deliberate inhalation may result in suffocation by oxygen displacement, central nervous system effects or cardiac sensitization effects. Gross over-exposure may be fatal. **Table 5** shows the applicable exposure limits for the component materials of CMS Solvent.

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Safety/Flammability

CMS Solvent exhibits no closed cup flash point per the Pensky-Martens Closed Cup Tester (ASTM D93) and is not classified as a flammable liquid by NFPA or DOT. The product does exhibit vapor flammability limits in air, and has the potential to ignite in an open vessel or in case of a spill, if an ignition source is present. However, laboratory tests with virgin solvent in an open vessel show the solvent did not sustain combustion, and quickly self-extinguishes. Users should clear equipment of all vapors and liquids before performing any maintenance operations that could result in an ignition source.

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.

Table 5
Exposure Limits

Component	Limit, ppm		Type
Vertrel® XF	AEL[a]	200 400	8- and 12-hr TWA Ceiling[b]
HFC-365mfc	AEL[a]	200	8-hr TWA
Trans-1,2-dichloroethylene	TLV[c]	200	8-hr TWA
Methanol	AEL	200	8- and 12-hr TWA
	TLV STEL[d]	200 250	8-hr TWA
Stabilizer	AEL	10	8- and 12-hr TWA
	TLV	20	8-hr TWA
CMS	AEL[a, b]	200	Calculated[e]

[a] AEL (Acceptable Exposure Limit) is an airborne inhalation exposure 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] STEL is short-term exposure limit established by ACGIH.

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

Recovery

CMS Solvent 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 CMS Solvent to ensure proper classification for waste disposal.

Storage/Handling

CMS Solvent 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 CMS Solvent.

Although CMS Solvent is not classified as a flammable liquid by DOT/NFPA, it does have flammable limits in air. A drum pump is recommended to dispense the product from its container. If an electric drum pump is used, avoid operation near open equipment or when solvent vapors are present. In these cases, consideration should be given to the use of a flammable-rated drum pump. If a large release of vapors occurs, such as from a large leak or spill, the vapors may concentrate near the floor or in subfloor areas and displace the oxygen available for breathing, causing suffocation. Evacuate everyone until the area has been well ventilated. Do not re-enter the affected areas without self-contained breathing apparatus unless the CMS Solvent concentration is below the AEL.

Environmental Legislation

CMS Solvent 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 (**Table 6**). The components of CMS Solvent 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.

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The methanol component of CMS Solvent is considered a hazardous air pollutant (HAP), and therefore is subject to NESHAP regulation. Methanol is included in the SARA Title III Section 313 list of toxic chemicals, and is subject to SARA Title III (EPCRA) reporting requirements.

Table 6
Environmental Properties

Property	ODP[a]	GWP (100 yr ITH)[b]	Photochemical VOC[c]
Vertrel® XF	0	1300	Exempt
HFC-365mfc	0	890	Exempt
Trans-1,2-dichloroethylene	0	—	Not Exempt
Methanol	0	—	Not Exempt
Stabilizer	0	—	Not Exempt

[a] ODP – ozone depletion potential
[b] GWP – global warming potential
[c] VOC – volatile organic compound

Packaging and Availability

CMS Solvent is available commercially in 55-gal (208-L) drums with a net weight of 500 lb (226 kg) and in 5-gal (19-L) pails with a net weight of 45 lb (20 kg). One-gallon and smaller samples in glass containers are available on request.

Specifications

Composition and specifications are shown in **Table 7**. All components are listed in the TSCA Inventory.

Table 7
CMS Solvent Specifications

Vertrel® XF, wt%	37.4 ± 1.0
HFC 365mfc, wt%	18.0 ± 1.0
Trans-1,2-dichloroethylene, wt%	41.0 ± 1.0
Methanol, wt%	3.5 ± 0.3
Stabilizer, wt%	0.10 ± 0.05
Nonvolatile Residue, ppm wt	100 max.
Moisture, ppm wt	200 max.
Appearance	Clear, colorless

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