

Aerosol formulations using 3M™ Novec™ Engineered Fluids

Aerosol formulation is a challenging science, especially when you factor in the need for non-flammability, low toxicity, high solubility, environmental sustainability and much more. At 3M, we've made challenging sciences our business and developed a comprehensive line of low environmental impact carrier solvents for aerosols – 3M™ Novec™ Engineered Fluids. With the use of high global warming potential (GWP) solvents becoming increasingly regulated and restricted, it's time to make the switch to Novec fluids, with all the performance, safety and sustainability benefits you need.

Properties	Unit	3M™ Novec™ Engineered Fluids				
		7100 / 7100DL ^a	7200 / 7200DL ^a	7500	7700	71D90 ^b
Boiling Point	°C (F)	61 (142)	76 (169)	128 (262)	167 (332)	43 (109)
Pour Point	°C (F)	-135 (-211)	-138 (-216)	-100 (-148)	-50 (-58)	-45 (-49)
Molecular Weight	g/mol	250	264	414	528	97 / 250 ^c
Maximum Use Temperature	°C (F)	<150 (302)	<150 (302)	<200 (392)	<200 (392)	<150 (302)
Flash Point ^d	°C (F)	None	None	None	None	None
Vapor Pressure	kPa	27	16	2.1	<0.1	54
Heat of Vaporization	kJ/kg	112	119	89	83	268
Liquid Density	g/cm ³	1.51	1.42	1.61	1.80	1.26
Coefficient of Expansion	K ⁻¹	0.0018	0.0016	0.0013	0.0011	-
Absolute Viscosity	cP	0.58	0.58	1.24	4.54	0.40
Specific Heat	J/kg-K	1183	1220	1128	1040	-
Surface Tension	mN/m	13.6	13.6	16.2	18	21.1
Solubility of Water in Fluid	ppm by weight	95	92	45	14	-
Solubility of Fluid in Water	by weight	12 ppm	<5 ppm	<4 ppb	<1 ppb	<6300 ppm ^e
Dielectric Strength Range, 0.1" gap	kV	> 25	> 25	> 25	> 25	-
Worker Exposure Guideline ^f	ppm	750	200	100	TBD ^g	200 / 750 ^h
Ozone Depletion Potential	ODP	0	0	0	0	0
Global Warming Potential ⁱ	GWP	297	57	100	436	32

Not for specification purposes. All values @ 25°C unless otherwise specified.

^a Novec Engineered Fluids with a DL designation are higher purity versions of that product number for deposition applications when high purity materials are needed.

^b 90% by weight trans-1,2-dichloroethylene; 10% by weight of Novec 7100 fluid

^c 97 g/mol = trans-1,2-dichloroethylene molecular weight; 250 g/mol = Novec 7100 fluid molecular weight

^d Per closed cup flash point, tested in accordance with ASTM D3278 test method.

^e <6300 ppm, reference tDCE solubility in water from "Industrial Solvents Handbook", Flick, E.W. (ed.) 1985

^f Recommended parts per million (ppm) for eight-hour average worker exposure per day as established by 90-day inhalation study. Study methodology based on American Industrial Hygiene Association exposure guidelines.

^g Novec 7700 fluid is low in acute toxicity and most applications have very low inhalation exposure. It is for these reasons that occupational exposure limits (OELs) have not yet been determined for this product.

^h trans-1,2-dichloroethylene has an 8-hour, time-weighted average (TWA) exposure guideline (EG) of 200 / EG for Novec 7100 fluid is 750.

ⁱ GWP-100 year ITH, CO₂ = 1.0, per IPCC 2013, with the exception of Novec 7100 and 7100DL fluids and blends containing Novec 7100 fluid, which note IPCC 2007.

Aerosol formulations using 3M™ Novec™ Engineered Fluids

Below are some recommendations to help with your formulations. 3M technical representatives are also available to help determine which 3M™ Novec™ Engineered Fluid is best for your specific needs and to help you with customizing your aerosol solution.

Properties	3M™ Novec™ Engineered Fluids				
	7100 / 7100DL	7200 / 7200DL	7500	7700	71D90
Fluorocarbon solubility	High	High	High	High	Low
Hydrocarbon solubility	Medium	Medium	Low	Low	Very High
Plastic/elastomer compatibility	High	High	Very High	Very High	Low
Applications					
Aerosol cleaners	●	●			●
Aerosol coatings	●	●			●
Dry lubricant aerosols / polytetrafluoroethylene (PTFE)	●	●	●	●	
Dissolving fluorochemicals	●	●	●	●	
Dissolving hydrocarbons	●	●			●
Reducing aerosol formulation flammability	●				
Improving aerosol CARB VOC compliance ¹		●			
Extending dry time			●	●	
Replacement for					
Chlorofluorocarbons (CFCs)	●	●			●
Hydrochlorofluorocarbons (HCFCs)	●	●			●
Hydrofluorocarbons (HFCs)	●	●			
Perfluorinated chemicals (PFCs)	●	●	●	●	
Perfluoropolyethers (PFPEs)	●	●	●	●	
n-propyl bromide (nPB)					●

¹ Does not exceed the volatile organic compound (VOC) limits set by the California Environmental Protection Agency Air Resources Board for aerosol formulations. It is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and that the end formulation meets the environmental and regulatory requirements of your area.

Have questions? Need technical assistance? Contact your 3M technical service representative. We're here to help.

IMPORTANT NOTICE: The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed. Contact your local 3M representative or visit 3M.com/Novec for more information. **Warranty and Limitation of Liability:** if there is a defect in this product, your exclusive remedy shall be product replacement or refund of the purchase price. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, INCLUDING ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. 3M will not be liable for any direct, indirect, special, incidental or consequential damage related to the use of this product.

Electronics Materials Solutions Division
3M Center, Building 224-3N-11
St. Paul, MN 55144-1000
1-800-810-8513
www.3M.com/novec

©2016 3M. All rights reserved.
3M and Novec are trademarks of 3M Company.
60-5002-0824-8
9/2018