

# Solvent cleaning with 3M™ Novec™ Engineered Fluids

The demand for exceptional performance while lowering operating costs has never been greater. Add the commitment to provide a safer workplace and reduce environmental impact and the challenge is intensified. That's where 3M™ Novec™ Engineered Fluids can help. Smart, safe and sustainable Novec fluids are effective replacements for n-propyl bromide (nPB or 1-bromopropane), trichloroethylene (TCE), ozone-depleting solvents such as HCFC-225 (AK-225) and HCFC-141b and high global warming potential (GWP) hydrofluorocarbons (HFCs). They can be used in a wide range of vapor degreasing, immersion, hand-wipe and spray cleaning applications.

Cleaning Performance		3M™ Novec™ Engineered Fluids								
		Light Duty			Medium Duty			Heavy Duty		
Properties	Unit	7100 / 7100DL <sup>a</sup>	7200 / 7200DL <sup>a</sup>	711PA	72FL	71DE	71DA	72DE	72DA	73DE
Formulation	%w/w	Novec 7100 (100%)	Novec 7200 (100%)	Novec 7100 (95%) Isopropanol (5%)	Novec 7200 (70%) t-DCE <sup>b</sup> (20%) Novec 7100 (10%)	Novec 7100 (50%) t-DCE <sup>b</sup> (50%)	Novec 7100 (53%) t-DCE <sup>b</sup> (45%) Ethanol (2%)	t-DCE <sup>b</sup> (70%) Novec 7200 (20%) Novec 7100 (10%)	t-DCE <sup>b</sup> (68%) Novec 7200 (20%) Novec 7100 (10%) Isopropanol (2%)	t-DCE <sup>b</sup> (85%) Novec 7300 (15%)
Boiling Point	°C	61	76	55	45	41	40	44	44	48
Flash Point <sup>c</sup>	°C	None	None	None	None	None	None	None	None	None
Vapor Pressure	kPa	26.9	16.0	27.6	44.0	51.0	50.8	46.7	48.0	35.1
Heat of Vaporization	kJ/kg	112	119	165	159	200	209	218	251	227
Liquid Density	g/cm <sup>3</sup>	1.51	1.42	1.48	1.40	1.37	1.33	1.28	1.27	1.28
Kinematic Viscosity	cSt	0.38	0.43	0.41	0.42	0.31	0.34	0.35	0.35	0.3
Specific Heat	J/kg·K	1183	1220	1255	1209	1192	1230	1210	1242	1201
Surface Tension	mN/m	13.6	13.6	14.5	16	16.6	16.4	19	18	19.9
Kauri-butanol value	Kb	10	10	8	12	27	33	52	58	83
Dielectric Strength Range, 0.1" gap	kV	> 25	> 25	> 10	> 25	> 25	> 15	> 25	> 25	> 35
Global Warming Potential <sup>d</sup>	GWP	297	57	284	70	149	157	41	41	47
Ozone Depletion Potential	ODP	0	0	0	0	0	0	0	0	0
Exposure Guidelines <sup>e</sup> (TLV / TWA)	ppmv	750	200	750/200	200/200/750	750/200	750/200/1000	200/200/750	200/200/750/200	200/100

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

<sup>a</sup> Each DL-designated product has specified maximum levels of various substances including: ions (ppb), metals (ppb) and water (ppm). Particles are monitored, but not specified. Please refer to each product's Product Information page for more information.

<sup>b</sup> trans-1,2-dichloroethylene

<sup>c</sup> Per closed cup Flash Point, tested in accordance with ASTM D3278 test method.

<sup>d</sup> GWP-100 year ITH, CO<sub>2</sub> = 1.0, per IPCC 2013, with the exception of Novec 7100 and 7100DL fluids and blends containing Novec 7100 fluid, which note IPCC 2007.

<sup>e</sup> Exposure Guideline set by the 3M Medical Department per 8 hr. time-weighted average (TWA). TLV = threshold limit value. The guidelines listed are for the respective components as listed in the formulation section. Occupational exposure limits (OELs) are based upon individual components; Novec 7100 fluid = 750 ppmv, Novec 7200 fluid = 200 ppmv, Novec 7300 fluid = 100 ppmv, t-DCE = 200 ppmv, EtOH = 1000 ppmv, IPA = 200 ppmv.

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These versatile, sustainable materials are effective on many soils, ranging from fingerprints and particulates, to tough no-clean flux and lead-free solder paste residues. 3M offers a wide variety of solvent solutions to meet your cleaning performance and materials compatibility needs. We are confident that 3M has the right solution for your precision cleaning application. To learn more about 3M™ Novec™ Engineered Fluids, visit [3M.com/Novec](http://3M.com/Novec).

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		Light Duty			Medium Duty			Heavy Duty		
		7100 / 7100DL <sup>a</sup>	7200 / 7200DL <sup>a</sup>	711PA	72FL	71DE	71DA	72DE	72DA	73DE
Replacement for	CFCs	•	•	•	•	•	•	•	•	•
	HCFCs	•	•	•	•	•	•	•	•	•
	HFCs	•	•	•	•	•	•	•	•	•
	TCE					•	•	•	•	•
	nPB					•	•	•	•	•
	Aqueous	•	•	•	•	•	•	•	•	•
Co-Solvent Cleaning		•	•	•						
Effectively Removes Soils	Light Oils	•	•	•	•	•	•	•	•	•
	Medium Oils				•	•	•	•	•	•
	Fluoro Lubes	•	•	•	•	•	•			
	Particulates	•	•	•						
	Ionic Soils			•			•		•	
	Greases					•	•	•	•	•
	Fluoro Greases	•	•	•	•	•	•			
	Silicones					•	•	•	•	•
	Fluoro Silicones					•	•	•	•	
	Flux						•		•	•
Wax					•		•	•	•	
Solubility	Fluorocarbon	High	High	High	High	Medium	Medium	Low	Low	Low
	Hydrocarbon	Medium	Medium	Medium	Medium	High	High	High	High	High
	Silicone	Low	Low	Medium	Medium	Medium	Medium	High	High	High
Compatibility with Materials <sup>b</sup>	Plastics	High	High	High	Requires Customer Testing					
	Acrylics	High	High	High	Medium	None	None	None	None	None
	ABS / Polycarbonate	High	High	High	Medium	None	None	None	None	None
	Solvent Resistant Plastics (nylon, PTFE, epoxy, PEEK)	High	High	High	High	High	High	High	High	High
	Silicones	Medium	Medium	Medium	Medium	Low	Low	Low	Low	Low
	Ceramics	High	High	High	High	High	High	High	High	High
	Metals	High	High	High	High	High	High	High	High	High
Precision Cleaning Application	Vapor Degreasing	•	•	•		•	•	•	•	•
	Immersion	•	•	•	•	•	•	•	•	•
	Hand-Wipe	•	•	•	•	•	•	•	•	•
	Spray Cleaning	•	•	•	•	•	•	•	•	•

<sup>a</sup> Each DL-designated product has specified maximum levels of various substances including: ions (ppb), metals (ppb) and water (ppm). Particles are monitored, but not specified. Please refer to each product's Product Information page for more information.

<sup>b</sup> Compatibility will vary based on temperature, exposure and material composition. It is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method of application.

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