

DuPont™ Krytox®

performance lubricants

Typical Properties* of Krytox® Aerospace Grade Fluorinated Oils

Property	ASTM Test Method	Test Conditions	Units	Aerospace Oil Grade					
				143AZ	143AA	143AY	143AB	143AC	143AD
Average Molecular Weight	NMR			1850	2450	3000	3700	6250	8250
Viscosity	ASTM D445	-32°C (-25°F)	cSt	3000	12000	22000	50000	—	—
		0°C (32°F)		140	340	600	1000	4200	9000
		20°C (68°F)		40	85	150	230	800	1600
		38°C (100°F)		18	35	55	85	270	500
		40°C (104°F)		16.7	32	50	77	243	448
		99°C (210°F)		3.3	5.3	7.5	10.3	26	43
		100°C (212°F)		3.2	5.2	7.4	10.2	25.4	42.5
		204°C (400°F)		0.77	1.1	1.4	1.8	3.9	6.0
		260°C (500°F)		—	—	—	—	2.1	3.0
Viscosity Index	ASTM D2270			29	89	107	113	134	144
ASTM Slope				0.84	0.77	0.72	0.68	0.59	0.55
Pour Point	ASTM D97		°C	-55	-50	-45	-40	-35	-30
			°F	-70	-60	-50	-40	-30	-20
Distillation Range	ASTM D1160	53 Pa (0.4 torr)	°C	140/210	170/245	190/265	215/290	260/370	300/400+
			°F	285/410	340/475	375/510	420/555	500/700	570/750+
Oil Density			g/mL						
		0°C (32°F)		1.91	1.92	1.93	1.93	1.95	1.95
		100°C (212°F)		1.72	1.74	1.75	1.75	1.77	1.78
Vapor Pressure	Knudsen	38°C (100°F)	torr	4 x 10 ⁻⁴	1 x 10 ⁻⁴	4 x 10 ⁻⁵	5 x 10 ⁻⁶	8 x 10 ⁻⁸	6 x 10 ⁻⁹
		260°C (500°F)	torr	1.5	0.8	0.15	3 x 10 ⁻²	2 x 10 ⁻³	3 x 10 ⁻⁴
		38°C (100°F)	kPa	5 x 10 ⁻⁵	1 x 10 ⁻⁵	5 x 10 ⁻⁶	7 x 10 ⁻⁷	1 x 10 ⁻⁸	8 x 10 ⁻¹⁰
		260°C (500°F)	kPa	0.2	0.1	2 x 10 ⁻²	4 x 10 ⁻³	3 x 10 ⁻⁴	4 x 10 ⁻⁵
Volatility	ASTM D972 (Mod.)	149°C (300°F)	wt% loss in 6-1/2 hr	10	5	1	—	—	—
		204°C (400°F)		60	30	10	5	1	—
		260°C (500°F)		—	—	45	30	4	2
		149°C (300°F)	wt% loss in 22 hr	20	5	3	1	—	—
		204°C (400°F)		80	40	20	5	1	—
		260°C (500°F)		—	—	60	40	6	3
Estimated Useful Range			°C	-57-149	-51-177	-46-204	-40-232	-34-288	-29-316
			°F	-70-300	-60-350	-50-400	-40-450	-30-550	-20-600

*This table gives typical properties (not specifications) based on historical production performance. Viscosity may vary within +10%. DuPont does not make any express or implied warranty that these products will continue to have these typical properties.

Figure 1. Viscosity vs. Temperature of Krytox® Aerospace Grade Fluorinated Oils

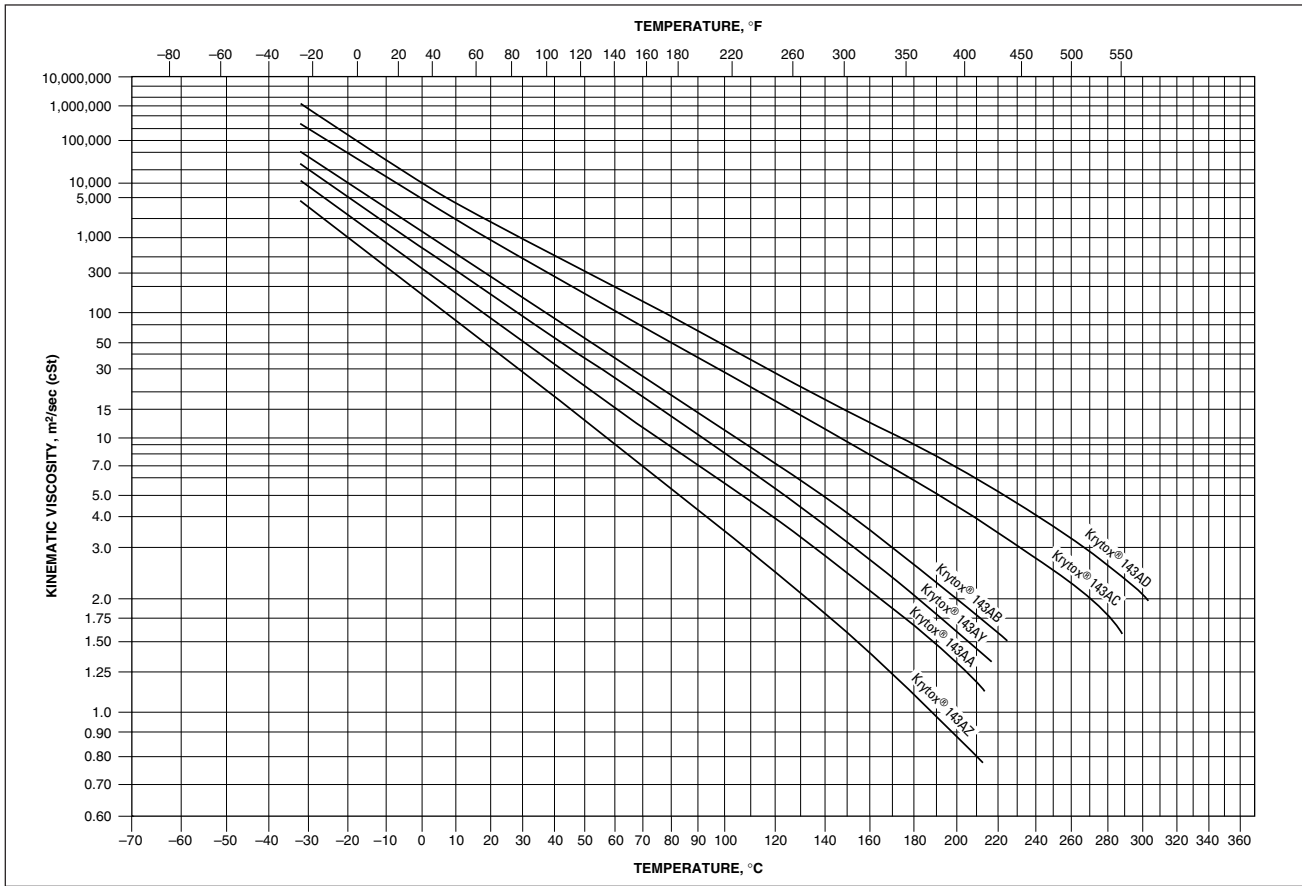
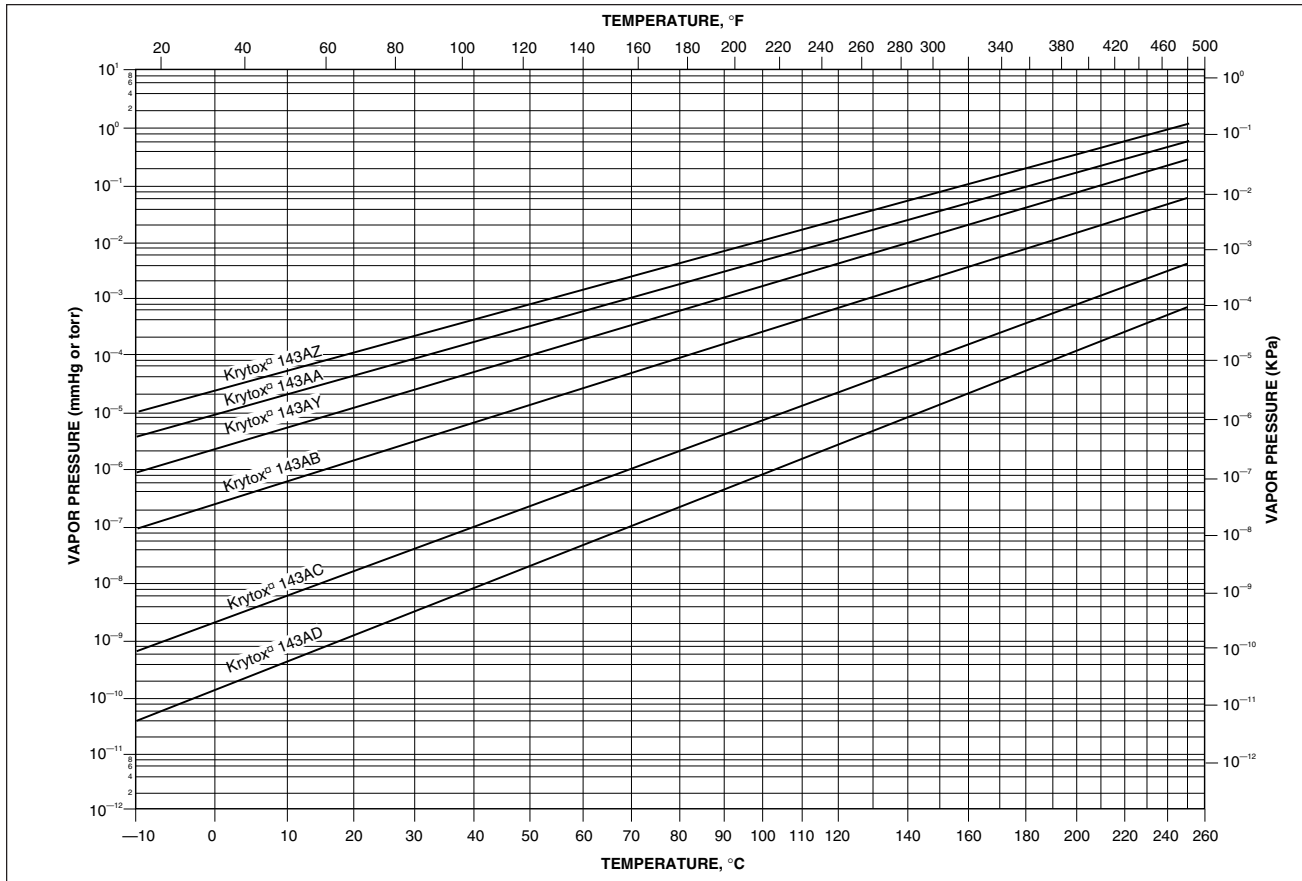


Figure 2. Vapor Pressure vs. Temperature of Krytox® Aerospace Grade Fluorinated Oils



Typical Properties* of Krytox® Aerospace Grade Fluorinated Greases

Aerospace Grease Grade			240AZ	240AA	240AB	240AC	240AD	
Extreme Pressure Grade			250AZ	—	—	250AC	250AD	
Rust Inhibited Grade			—	—	280AB	280AC	—	
Rust Inhibited Grade			283AZ	283AA	283AB	283AC	283AD	
Viscosity of Base Oil	ASTM D445	cSt						
20°C (68°F)			40	85	230	800	1600	
38°C (100°F)			18	35	85	270	500	
99°C (210°F)			3.3	5.3	10.3	26	43	
204°C (400°F)			0.77	1.1	1.8	3.9	6.0	
Vapor Pressure of Base Oil	Knudsen							
38°C (100°F)		torr	4 x 10 ⁻⁴	1 x 10 ⁻⁴	5 x 10 ⁻⁶	8 x 10 ⁻⁸	6 x 10 ⁻⁹	
260°C (500°F)		torr	1.5	0.8	3 x 10 ⁻²	2 x 10 ⁻³	3 x 10 ⁻⁴	
Volatility of Base Oil	ASTM D972 (Mod)	wt% loss in 22 hr						
149°C (300°F)			20	5	1	—	—	
204°C (400°F)			80	40	5	1	—	
260°C (500°F)			—	—	40	6	3	
Pour Point of Base Oil	ASTM D97							
		°C	-55	-50	-40	-35	-30	
		°F	-70	-60	-40	-30	-20	
Texture							Buttery	
Penetration	ASTM D217	60 Strokes					265–295	
Mechanical Stability	ASTM D217	10,000 and 100,000 Strokes					No change from original grade	
Oxidation Stability	ASTM D942	99°C (210°F)					0 psig O ₂ pressure drop after 600 hr	
Liquid Oxygen Impact	ASTM D2512, NASA MSFC 106B						Pass	
Grease Density, g/mL		25°C (77°F)	1.89	1.91	1.92	1.93	1.93	
Oil Separation	FTMS 791B 321.1	99°C (210°F) 204°C (400°F)	wt% loss in 30 hr	6 —	5 20	4 12	3 11	3 10
Evaporation	FTMS 791B 350.1	99°C (210°F) 204°C (400°F) 260°C (500°F)	wt% loss in 22 hr	15 70 —	8 35 Not tested	1 9 40	— 1 6	Not tested 1 6
Estimated Useful Range		°C	-57–149	-51–177	-40–232	-34–288	-29–316	
		°F	-70–300	-60–350	-40–450	-30–550	-20–550+	

* This table gives typical properties (not specifications) based on historical production performance. Viscosity may vary within +10%. DuPont does not make any express or implied warranty that these products will continue to have these typical properties.

Krytox® 143 series oils are clear, colorless, fluorinated synthetic oils that are nonreactive, nonflammable, safe in chemical and oxygen service, and are long-lasting. Krytox® is a perfluoropolyether (PFPE)—also called perfluoroalkylether (PFAE) or perfluoropolyalkylether (PFPAE)—with the following chemical structure:



The polymer chain is completely saturated and contains only carbon, oxygen, and fluorine. On a weight basis, a typical Krytox® oil contains 21.6% carbon, 9.4% oxygen, and 69.0% fluorine.

All standard grades of grease are thickened with Krytox® 2000 polytetrafluoroethylene PTFE, whose formula is $(\text{CF}_2-\text{CF}_2)_n$. This special high efficiency thickener has a melting point of 325°C (617°F) and has low molecular weight and submicron (0.2 μm) particle size for higher performance in bearings.

Krytox® 240 series greases are white buttery greases with all of the same properties as the 143 series oils that they are made from, but they are in grease form.

Krytox® 250 series EP greases are black greases that contain molybdenum disulfide added as an extreme pressure additive for highly loaded gears and bearings.

Krytox® 283 series anticorrosion greases are white greases that contain sodium nitrite. These grades provide rust protection at ambient temperatures, corrosion protection at high temperatures, and antiwear protection.

For more information or technical assistance, call:

(800) 424-7502

or visit us on the Web:

<http://www.krytox.com>

Or call the Krytox® hotline in the **United States** at (800) 424-7502, E-mail: krytox@usa.dupont.com

Canada at 800-263-5924, E-mail: products@can.dupont.com

Europe, Mideast, and Africa at +32.3.543.1267, E-mail: lubricants@lux.dupont.com

Asia/Pacific—including India at 886-2-2514-4434, E-mail: krytox.lubricants@twn.dupont.com

Mexico and Central America at 011-52-55-5722-1150, E-mail: ceac@mex.dupont.com

South America—all Countries at 55-11-4166-8601, E-mail: produtos.brasil@bra.dupont.com

The information set forth herein is furnished free of charge and is based on technical data that DuPont believes to be reliable. It is intended for use by persons having technical skill and at their own discretion and risk. Because conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. Nothing herein is to be taken as a license to operate under or a recommendation to infringe any patents.

The DuPont oval logo, DuPont™, The miracles of science®, and Krytox® are trademarks or registered trademarks of DuPont.

Copyright © 2003 E.I. du Pont de Nemours and Company. All rights reserved.



The miracles of science®