Krytox™
Performance Lubricants

# Aerospace Grade Oils and Greases

## Product Information

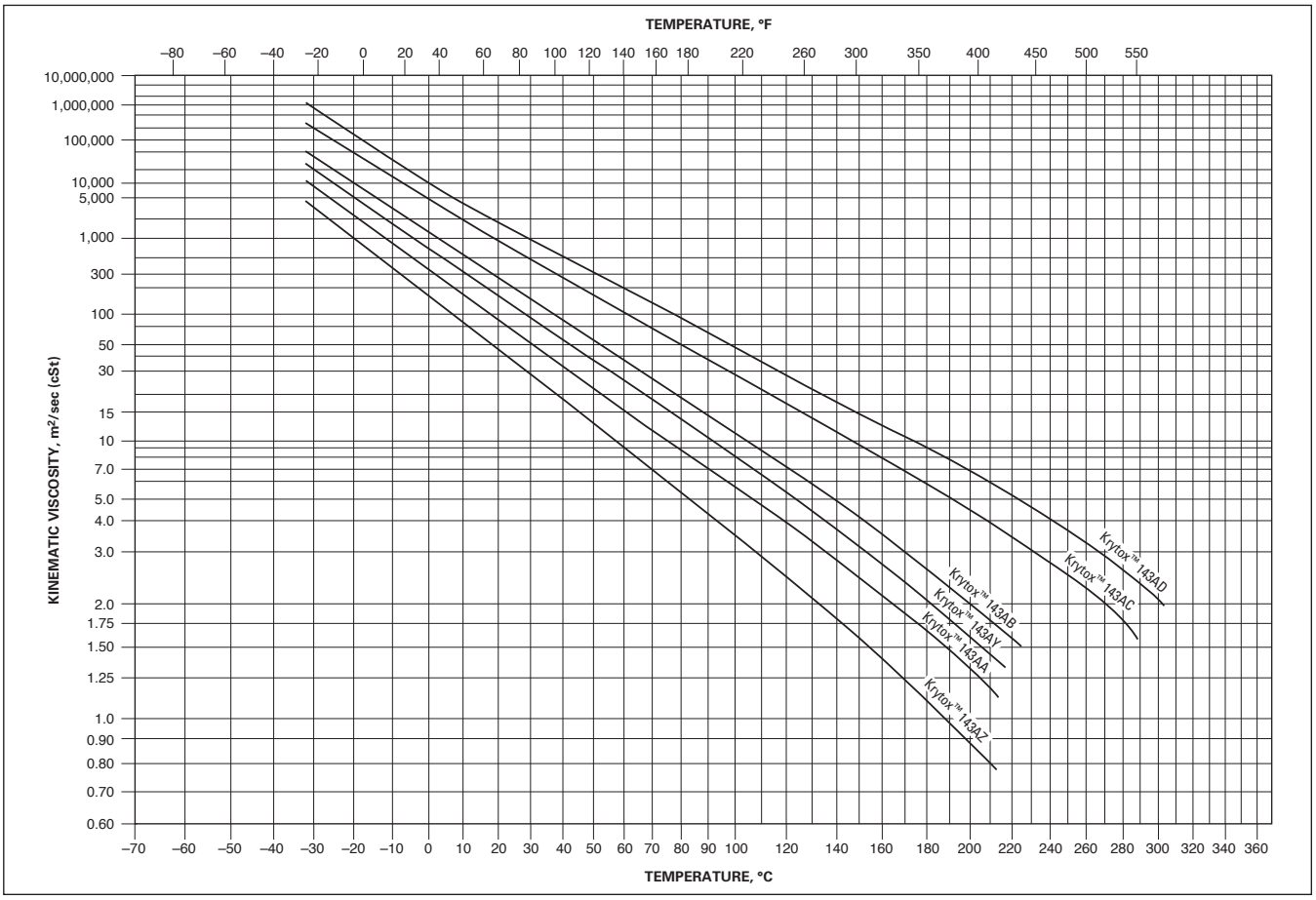
### Typical Properties of Krytox™ Aerospace Grade Fluorinated Oils*

| | | | | Aerospace Oil Grade | | | | |
|---|---|---|---|---|---|---|---|---|
| Property | ASTM Test Method | Test Conditions | Units | 143AZ | 143AA | 143AB | 143AC | 143AD |
| Average Molecular Weight | NMR | | | 2060 | 2210 | 3800 | 5940 | 7480 |
| Viscosity | ASTM D445 | −32 °C (−25 °F) | cSt | 7480 | 12,340 | 44,620 | — | — |
| | | 0 °C (32 °F) | | 228 | 350 | 1070 | 3940 | 7500 |
| | | 20 °C (68 °F) | | 60 | 88 | 240 | 800 | 1540 |
| | | 38 °C (100 °F) | | 24.7 | 35 | 86 | 270 | 502 |
| | | 40 °C (104 °F) | | 22.8 | 32 | 78 | 243 | 450 |
| | | 99 °C (210 °F) | | 4.2 | 5.4 | 10.5 | 26 | 44 |
| | | 100 °C (212 °F) | | 4.1 | 5.3 | 10.2 | 25.4 | 42.4 |
| | | 204 °C (400 °F) | | 1.1 | 1.3 | 2.1 | 4.1 | 6.0 |
| | | 260 °C (500 °F) | | — | — | — | 2.4 | 3.4 |
| Viscosity Index | ASTM D2270 | | | 60 | 96 | 113 | 134 | 146 |
| Pour Point | ASTM D97 | | °C | −55 | −50 | −40 | −35 | −30 |
| | | | °F | −70 | −60 | −40 | −30 | −20 |
| Distillation Range | ASTM D1160 | 53 Pa (0.4 torr) | °C | 140/210 | 170/245 | 215/290 | 260/370 | 300/400+ |
| | | | °F | 285/410 | 340/475 | 420/555 | 500/700 | 570/750+ |
| Oil Density | | 0 °C (32 °F) | g/mL | 1.91 | 1.92 | 1.93 | 1.95 | 1.95 |
| | | 100 °C (212 °F) | | 1.72 | 1.74 | 1.75 | 1.77 | 1.78 |
| Vapor Pressure | Knudsen | 38 °C (100 °F) | torr | $4 \times 10^{-4}$ | $1 \times 10^{-4}$ | $5 \times 10^{-6}$ | $8 \times 10^{-8}$ | $6 \times 10^{-9}$ |
| | | 260 °C (500 °F) | torr | 1.5 | 0.8 | $3 \times 10^{-2}$ | $2 \times 10^{-3}$ | $3 \times 10$ |
| | | 38 °C (100 °F) | KPa | $5 \times 10^{-5}$ | $1 \times 10^{-5}$ | $7 \times 10^{-7}$ | $1 \times 10^{-8}$ | $8 \times 10^{-10}$ |
| | | 260 °C (500 °F) | KPa | 0.2 | 0.1 | $4 \times 10^{-3}$ | $3 \times 10^{-4}$ | $4 \times 10^{-5}$ |
| Volatility | ASTM D2595 | 149 °C (300 °F) | wt% loss | 18 | 15 | 1.9 | — | — |
| | | 204 °C (400 °F) | in 22 hr | — | — | 17.3 | <1 | — |
| | | 260 °C (500 °F) | | — | — | 76.2 | 4 | 2 |
| Estimated Useful Range | | | °C | −57–149 | −51–177 | −40–232 | −34–288 | −29–316 |
| | | | °F | −70–300 | −60–350 | −40–450 | −30–550 | −20–600 |

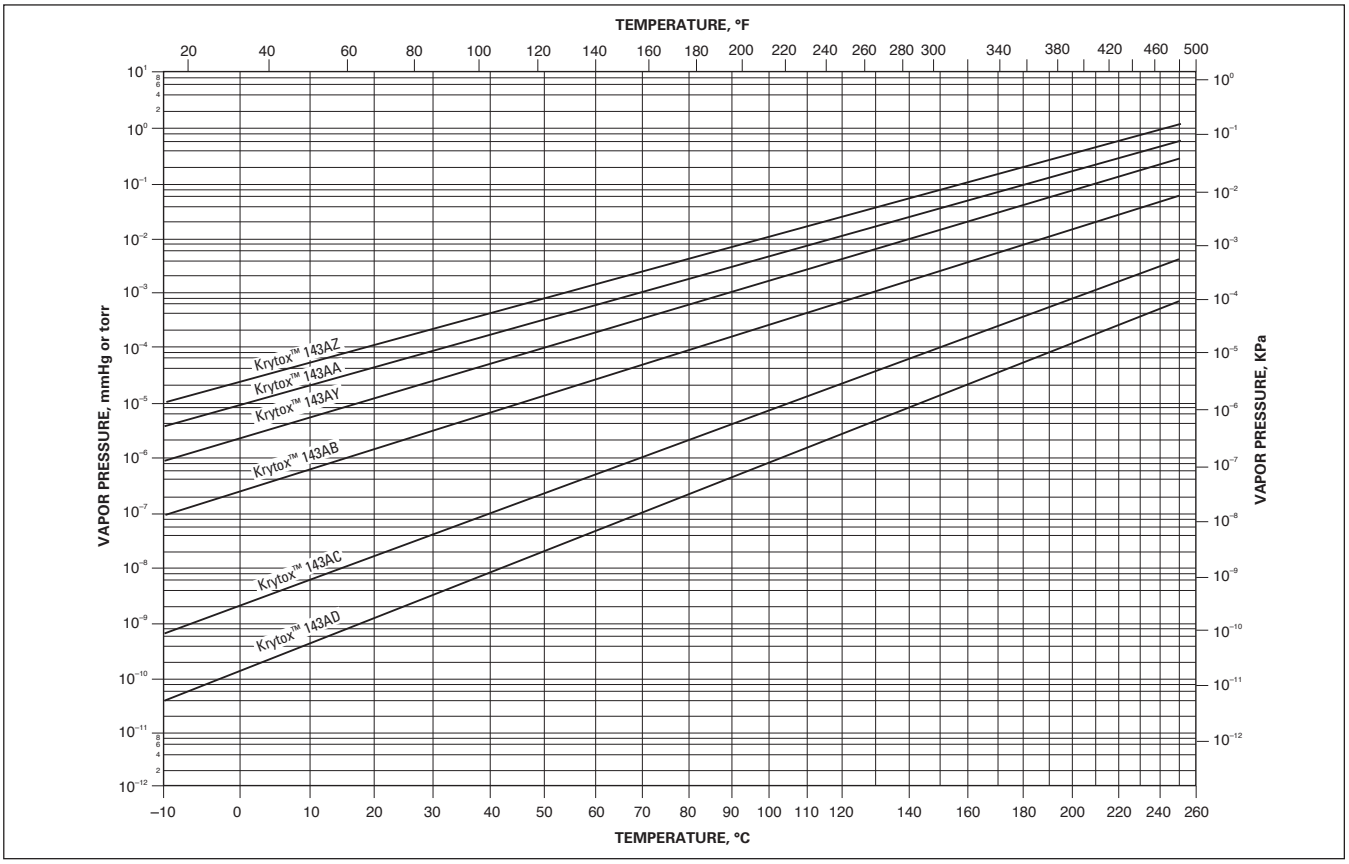
* This table gives typical properties (not specifications) based on historical production performance. Viscosity may vary within +10%. Chemours does not make any express or implied warranty that these products will continue to have these typical properties.

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## 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*

| Property | ASTM Test Method | Test Conditions | Units | Aerospace Grade | | | | |
|---|---|---|---|---|---|---|---|---|
| Aerospace Grease Grade | | | | 240AZ (H-1) | 240AA | 240AB (H-1) | 240AC (H-1) | 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 | 20 °C (68 °F)<br>38 °C (100 °F)<br>99 °C (210 °F)<br>204 °C (400 °F) | cSt | 60<br>24.7<br>4.2<br>1.08 | 88<br>35<br>5.4<br>1.3 | 240<br>86<br>10.5<br>2.1 | 800<br>270<br>26<br>4.1 | 1540<br>502<br>44<br>6.0 |
| Vapor Pressure of Base Oil | Knudsen | 38 °C (100 °F)<br>260 °C (500 °F) | torr<br>torr | $4 \times 10^{-4}$<br>1.5 | $1 \times 10^{-4}$<br>0.8 | $5 \times 10^{-6}$<br>$3 \times 10^{-2}$ | $8 \times 10^{-8}$<br>$2 \times 10^{-3}$ | $6 \times 10^{-9}$<br>$3 \times 10^{-4}$ |
| Volatility of Base Oil | ASTM D2595 | 149 °C (300 °F)<br>204 °C (400 °F)<br>260 °C (500 °F) | wt% loss in 22 hr | 18<br>—<br>— | 15<br>—<br>— | 1.9<br>17.3<br>76.2 | —<br><1<br>4 | —<br>—<br>2 |
| Pour Point of Base Oil | ASTM D97 | | °C<br>°F | −55<br>−70 | −50<br>−60 | −40<br>−40 | −35<br>−30 | −30<br>−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 | | 25 °C (77 °F) | g/mL | 1.89 | 1.91 | 1.92 | 1.93 | 1.93 |
| Oil Separation | ASTM D6184 | 99 °C (210 °F)<br>204 °C (400 °F) | wt% loss in 30 hr | 6<br>— | 5<br>20 | 4<br>12 | 3<br>11 | 3<br>10 |
| Estimated Useful Range | | | °C<br>°F | −57–149<br>−70–300 | −51–177<br>−60–350 | −40–232<br>−40–450 | −34–288<br>−30–550 | −29–316<br>−20–550+ |

* This table gives typical properties (not specifications) based on historical production performance. Viscosity may vary within +10%. Chemours 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 non-reactive, 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:

$$F\text{-}(CF\text{-}CF_2\text{-}O)_n\text{-}CF_2CF_3 \quad \text{where } n = 10\text{–}60$$
$$\quad\;\; | \qquad\qquad\qquad\qquad\quad$$
$$\quad\;\; CF_3$$

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 high efficiency PTFE, whose formula is $(CF_2\text{-}CF_2)_n$. This special high efficiency thickener has a melting point of 325 °C (617 °F), and has low molecular weight and submicron (0.2 µ) particle size for higher performance in bearings.

Krytox™ 240 series greases are white buttery greases with all of the same properties as our 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.

Krytox™ 240 AC, 240 AB, and 240 AZ Grade 1 greases now have NSF approval for incidental food contact (H-1) in and around food processing areas. These three products meet the requirements of Mil Spec PRF 27617, Types 1, 2, and 3.

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For product information, industry applications, technical assistance, or global distributor contacts, visit krytox.com or within the U.S. and Canada, call 1-844-773-CHEM/2436 or outside of the U.S., call 1-302-773-1000.

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