Krytox™
Performance Lubricants

Grease and Oil Lubrication for Sunroof Systems

Product Information

A Lifetime of Lubrication for Smooth Operation and Noise Mitigation in Sunroof Systems

There are multiple application areas within a sunroof system that require lubrication from either a mechanical (drive system, control brackets, slides) or a noise mitigation (moving panels, roof system frame, body structure, weather stripping) standpoint. The movement of metal on plastic, weather stripping to glass or painted surfaces, among others, can generate noises typically described as squeaks, itches, or judders. When failure of these components is not an option, whether because of durability, warranty, safety, loss of productivity, or downtime, Krytox™ products are an ideal solution for the automotive sunroof industry.

Krytox™ performance lubricants are fully synthetic perfluoropolyether (PFPE) oils and greases. They offer an exceedingly long life and outstanding properties for the prevention of noise, vibration, and harshness (NVH) and superior lubrication of mechanical systems.

- Ability to survive extreme temperatures and water washout
- Non-damaging to plastic or elastomers
- Noncorrosive to metals
- Nonoxidizing
- Extended lubricant life due to low volatility and outgassing
- Nonhazardous and nontoxic
- Indefinite shelf life if unopened and stored in a clean, dry location
- Both oils and greases are suitable for automated spray application

Areas that require lubrication from a mechanical standpoint:

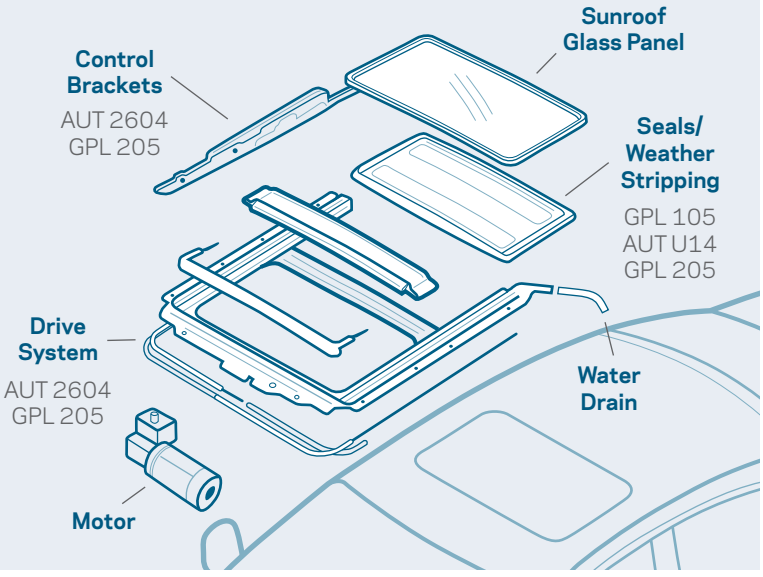
Drive System—motor and cables

Control Brackets and Slides—attached to cables and the glass (moving) panel, control the actuation of the sunroof

Areas that need lubrication from a noise mitigation standpoint:

Seals/Weather Stripping—moving panels, roof system frame, body structure

- Seals fixed to the roof structure frame or glass
- Seals fixed to the body structure



Chemours™

Krytox™ GPL 205 Grease

Krytox™ GPL 205 grease is a polytetrafluoroethylene (PTFE)-thickened PFPE oil that contains no additives and can be used on various components, including those that are exposed to harsh environmental factors such as rain, snow, dust, salt, cleaning and car care products, and common automotive fluids. Krytox™ GPL 205 has been widely used by OEMs in mechanical sunroof systems and seals.

Typical Properties	Krytox™ GPL 205
Estimated Useful Temperature Range	-36 to +204 °C (-33 to +400 °F)
Oil Separation, wt% after 30 hr, 99 °C (210 °F)	5
Max. Oil Volatility, % in 22 hr, ASTM D2595, 121 °C (250 °F)	1
Oil Viscosity, cSt, at 40 °C (104 °F)	160
Oil Viscosity, cSt, at 100 °C (212 °F)	18

Krytox™ AUT 2604 Grease

Krytox™ AUT 2604 grease contains PFPE oil and a special PTFE thickener for enhanced performance in mechanical application areas of sunroof systems. Designed to provide a thin, long-lasting, and even film on contact surfaces, it promotes smooth motion. Krytox™ AUT 2604 is specifically formulated for a broad temperature range, exhibiting very good low temperature characteristics, as well as enhanced load and wear performance at high temperatures.

Typical Properties	Krytox™ AUT 2604
Estimated Useful Temperature Range	-60 to +204 °C (-76 to +400 °F)
Oil Separation, wt% after 30 hr, 99 °C (210 °F)	4
Max. Oil Volatility, % in 22 hr, ASTM D2595, 121 °C (250 °F)	0.5
Oil Viscosity, cSt, at 40 °C (104 °F)	140
Oil Viscosity, cSt, at 100 °C (212 °F)	32

Krytox™ GPL 105 Oil

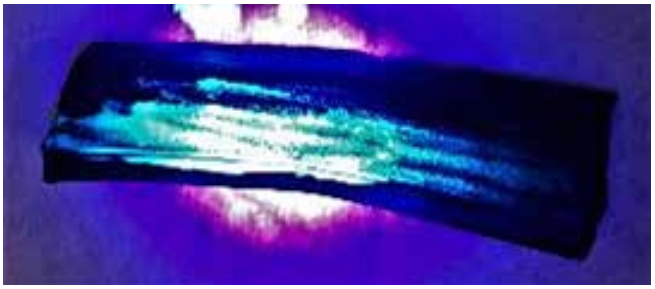
Krytox™ GPL 105 oil is a clear, colorless, fluorinated synthetic PFPE oil designed to reduce friction and wear, while extending equipment life in severe duty applications. Krytox™ GPL 105 oil has been used by OEMs to prevent weather stripping issues on sunroofs, such as NVH (noise, vibration, and harshness) and BSR (buzz, squeak, and rattle) that can occur over a vehicle's lifetime.

Typical Properties	Krytox™ GPL 105
Estimated Useful Temperature Range	-36 to +204 °C (-33 to +400 °F)
Max. Oil Volatility, % in 22 hr, ASTM D2595, 121 °C (250 °F)	1
Oil Viscosity, cSt, at 40 °C (104 °F)	160
Oil Viscosity, cSt, at 100 °C (212 °F)	18

The application of Krytox™ GPL 105 oil to weather stripping offers enhanced protection from damaging ultraviolet (UV) rays in sunlight.

Krytox™ AUT U14 Oil

Krytox™ AUT U14 is a proprietary blend of PFPE oils containing a dye that, when exposed to a UV or "black light" gives off a yellow-green color. This allows visual confirmation of coverage for quality control purposes, as illustrated in the pictures below:



Like Krytox™ GPL 105, Krytox™ AUT U14 combats NVH and BSR problems and helps protect seals and weather stripping in automotive sunroofs from UV damage.

Typical Properties	Krytox™ AUT U14
Estimated Useful Temperature Range	-36 to +204 °C (-33 to +400 °F)
Oil Viscosity, cSt, at 40 °C (104 °F)	50
Oil Viscosity, cSt, at 100 °C (212 °F)	8

Performance Testing

Microscopic images show that Krytox™ AUT U14 wets the surface of weather stripping more uniformly than other PFPE offerings, including standard GPL 105 oil. This leads to a lower static and dynamic coefficient of friction, reducing slip-stick and noise in sunroof systems.

Figure 1 shows a non-treated weather stripping surface.

Figure 2 shows how a standard PFPE oil can pool unevenly on the surface.

Figure 3 shows how the special formulation of Krytox™ AUT U14 provides uniform coverage of PFPE oil.

Zins Ziegler Analysis

When an automobile is in motion, contacting surfaces elastically deform and store energy. When this energy is released, it can produce noise in the form of audible squeaks or rattles.

Zins Ziegler is a standard automotive industry test apparatus for measuring the noise potential of different material pairings. It measures static and dynamic coefficients of friction between material pairings to calculate a risk priority number (RPN). The test method uses standard protocols to simulate driving cycles up to 100,000 kilometers. Material pairings with a high RPN are more likely to have stick-slip issues and produce noise.

Figure 1 Non-treated

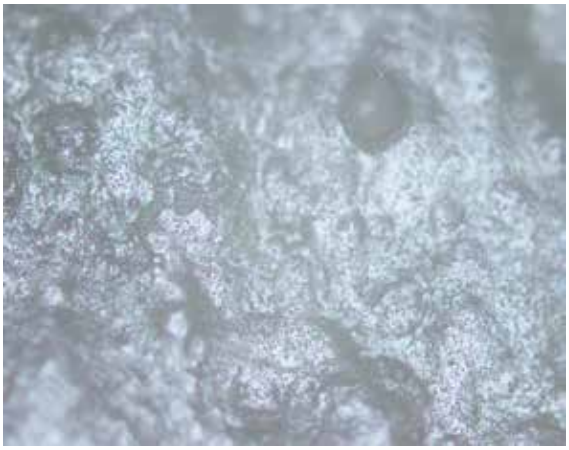


Figure 2 Treated with standard PFPE

Figure 3 Treated with Krytox™ AUT U14

The table below illustrates how the presence of environmental contamination (dust) greatly increases the RPN number between weather stripping and painted panels, thus increasing the propensity to create noise.

Coating the weather stripping with Krytox™ AUT U14 reduces the RPN number compared to untreated or a competitive PFPE coating.

Zins Ziegler Analysis with China Dust

		No Lubricant				Krytox™ AUT U14				PFPE Competitor			
		Baseline	With Contamination			Baseline	With Contamination			Baseline	With Contamination		
Force (N)	Speed (mm/s)	RPN - 0	RPN - 0	RPN – 5000 km	RPN – 10000 km	RPN - 0	RPN - 0	RPN – 5000 km	RPN – 10000 km	RPN - 0	RPN - 0	RPN – 5000 km	RPN – 10000 km
2	1	1	1	2.5	3	1.5	1	1.7	2.7	1.5	1.5	3.5	5
2	5	1	1	3	2.5	1	1	2.3	2.3	1	3	2.5	2.5
2	9	1	1	1.5	1	1	1.3	3.3	2.3	1	4	1.5	1
5	1	1.5	1	6.5	6.5	2	1.3	1.7	3.3	2	1.5	4.5	7
5	5	1	1	3.5	2.5	1	1.3	2.3	2.3	1	3	2.5	5
5	9	1	1	1	1	1	3.3	3.7	3	1	4.5	2	1
10	1	1.5	2	8.5	8.5	2	1.7	1.7	4	2	2	6	9
10	5	1	1.5	3.5	4	1	2.3	3.7	3.7	1	2.5	4.5	6
10	9	1	1	2	1.5	1	3.7	4.3	4	1	3	2.5	2
15	1	1.5	4.5	9	9	2	1.7	2.7	4	2	1.5	7	9
15	5	1	2.5	4.5	5	1	3.3	3.7	3.3	1	2	5	7
15	9	1	1.5	2	1.5	1	4.3	5	4	1	3	3	2.5
20	1	1	6	9.5	9.5	1	1	2.3	3.3	1	1	8	9
20	5	1	3	5.5	6	1	2	3.3	3.3	1	1	6	7.5
20	9	1	2.5	3	2.5	1	4.3	4.7	4	1	2	3	5
25	1	1	8	9.5	9	1	1	2.7	3.3	1	1	8	9.5
25	5	1	5	6.5	6.5	1	1.7	3	3.3	1	1	6.5	8
25	9	1	3	3.5	3	1	4	4.7	4.3	1	1	4.5	6.5

1-3: Low noise and no stick-slip 4-5: Noise and stick-slip can occur 6-10: Poor noise and stick-slip behavior

Compatibility

Krytox™ lubricants are chemically inert and compatible with virtually all automotive construction materials, including paint finishes, seal materials, glass, leather, textiles, plastics, and metals.

Using Krytox™ Performance Lubricants

For further advice on the use of Krytox™ oils and greases, please consult the technical data sheet or call your local Krytox™ representative for guidance.

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.

C-11916 (4/20)