

## Chemical Stability

### Product Information

**Krytox™ perfluoropolyether (PFPE) oils and greases thickened with polytetrafluoroethylene (PTFE) exhibit exceptional chemical stability.**

Chemical stability and inertness are critical characteristics of Krytox™ perfluorinated lubricants (PFPE). Krytox™ oils and greases will not react with most chemicals\* or other lubricants, nor cause them to degrade. In addition, as a result of their solubility characteristics and density, Krytox™ lubricants do not mix well with most chemicals or other hydrocarbon-based lubricants and will separate out. Krytox™ oils and greases are completely insoluble in water.

Krytox™ PFPE oils are essentially inert to most chemicals. No reaction is observed with boiling sulfuric acid, fluorine gas at 200 °C (392 °F), molten sodium hydroxide, chlorine trifluoride at 10–50 °C (50–122 °F), uranium hexafluoride gas at 50 °C (122 °F), or any of the following materials at room temperature: JP-4 turbine fuel, unsymmetrical dimethyl-hydrazine, hydrazine, diethylenetriamine, ethyl alcohol, aniline, 90% hydrogen peroxide, red fuming nitric acid, or nitrogen tetroxide. Krytox™ oils are slightly soluble in hydrazine and have moderate (25–30%) solubility in nitrogen tetroxide.

Krytox™ oils are not soluble in common organic solvents, acids, and bases, although some solvents will dissolve PFPE oils. Krytox™ oils are completely miscible in highly fluorinated solvents and refrigerant gases, such as:

- Trichlorotrifluoroethane (Freon™ 113)
- Hexafluorobenzene
- 2,3-dihydrodecafluoropentane (Vertrel™ XF)
- Perfluorooctane

- Perfluorohexane
- Perfluorodimethylcyclobutane isomers
- 1,1 dichloro-1-fluoroethane

These fluorinated solvents will not react with PFPE oils, but the oils will be carried away from the lubricating point. PFPEs are freely soluble in supercritical CO<sub>2</sub>.

Krytox™ lubricants have also been tested and used in the presence of gaseous, liquid oxygen and chlorine with no reactivity noted.

Krytox™ lubricants are safe for use with rubber, elastomers, plastics, and metals commonly used as seals and bearings.

A type of chemical known as a Lewis acid (electron pair acceptor) can react with PFPE oils and will limit the temperature at which they can be used. Typical Lewis acids are boron trifluoride, aluminum chloride, iron (III) chloride, and titanium tetrachloride. At elevated temperatures, these materials can lead to decomposition of any PFPE.

Caution should be taken with metallic alkali, such as sodium and lithium metals, as reactions could occur readily.

Some grease grades contain additives for anti-corrosion or extreme pressure, and these additives do not have the same chemical stability as oils and thickeners. In chemical contact applications, it is typically common to use greases without additives.

Krytox™ performance lubricants are not only resistant to oxygen and reactive gases, but they are inert to virtually all chemicals commonly used in most industries.

\*Exceptions include Lewis acids and alkali metals

Krytox™ lubricants have been used in contact with the following chemicals, in addition to many others not listed:

Acetone	Ethane	Isopropyl Alcohol	Phosgene
Acetylene	Ethyl Alcohol	JP-4 and -8 Turbine Fuel	Phosphoric Acids
Acrylonitrile	Ethyl Chloride	Lithium Glycol	Polyalkylene Glycols
Alcohol	Ethylene	Methane	Polyalphaolefins
Ammonia	Ethylene Glycol	Methanol	Polyol Ester Oils
Ammonium Nitrate	Ethylene Oxide	Methylamine	Polyphenyleneoxide (PPO)
Aniline	Fluorine	Methylbromide	Potassium Chloride
Aqueous Caustic	Formaldehyde	Methylchloride	Potassium Hydroxide
Benzene	Gasoline	Methylmercaptan	Potassium Permanganate
Boiling Sulfuric Acid	Helium	Methylsilane	Propane
Brake Fluids	Heptane	Mineral Acids	Propylene
Bromine	Hexafluoropropylene	Molten Caustic	Red Fuming Nitric Acid
Butadiene	Hexane	Monosilane	Silicone Products
Butane	Hydrazine	Natural Gas	Sodium Hydroxide
Butylene	Hydrobromic Acid	Nitric Acid	Sulfur Hexafluoride
Carbon Dioxide	Hydrocarbon Compounds	Nitrogen	Sulfur Oxides
Carbon Monoxide	Hydrocarbon Oils	Nitrogen Oxide	Sulfuric Acid
Carbon Tetrachloride	Hydrochloric Acid	Nitrogen Tetroxide	Unsymmetrical Dimethyl-
Chlorine, Liquid or Gas	Hydrocyanic Acid	Nitrogen Trifluoride	Hydrazine
Chlorine Trifluoride	Hydrofluoric Acid	Nitrous Oxide (Anesthesia)	Uranium Hexafluoride
Chloroform	Hydrogen	Organic Acids	Trifluoroacetylchloride
Dichlorosilane	Hydrogen Bromide	Organic Compounds	Trimethylamine
Diesel Fuel	Hydrogen Chloride	Oxygen, Liquid or Gas	Vinyl Bromide
Diethylenetriamine	Hydrogen Peroxide	Ozone	Vinyl Chloride
Dimethylether	Hydrogen Sulfide	Pentane	Vinyl Fluoride
Ester Oils	Iodine	Perchloroethylene	Water, Steam

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For product information, industry applications, technical assistance, or global distributor contacts, visit [krytox.com](http://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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Replaces: K-20564-3  
C-10355 (10/17)