Lubricants, Oils & Paste

Ratermann Manufacturing, Inc. carries a wide range of lubricants, oils and pastes for your specific applications.

INDEX

RATERMANN
MANUFACTURING, INC.

VACUUM PUMP OILS & GREASE

Premium Zero Flash Point Oil

Made with PFPE for Longer Pump Life

- Chemical Inert

100% Oxygen Compatible

Premium Zero Flash Point Krytox Oil Light Weight Viscosity

Part #	Description	Size Container
KRY-VPF1506P	Krytox 1506	Pint
KRY-VPF1506Q	Krytox 1506	1 Quart
KRY-VPF15061G	Krytox 1506	1 Gallon

Standard Weight Viscosity

Part #	Description	Size Container
KRY-VPF1514P	Krytox 1514	Pint
KRY-VPF1514Q	Krytox 1514	1 Quart
KRY-VPF15141G	Krytox 1514	1 Gallon

One Quart = 4 Pounds

General Purpose Grease for

- Valves
- Fittings
- Regulators
- Truck Pallets
- Oxygen Dewars, Casters and Handles

part # CGV-2-F12

Valves

Regulator

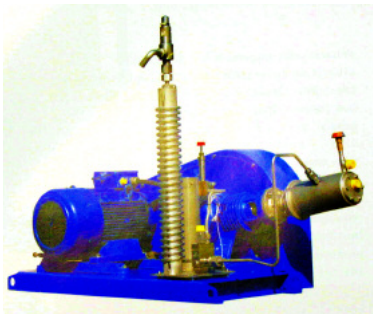
Part #	Description	Size Container
KRY-GPL2262OZ	226 Grease	2 Oz. Tube
KRY-GPL2268OZ	226 Grease	8 Oz. Tube
KRY-GPL2261LB	226 Grease	1 Lb. Jar

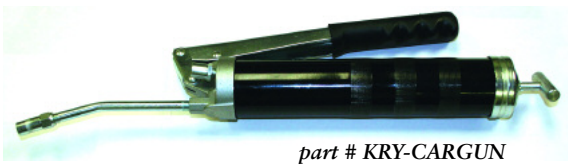
Cryo Pump Grease

- Cryostar Pumps
- ACD Cryo Pumps
- Bearings
- Krytox GPL-226 Cartridge
  1.75 Pounds to a Cartridge

for Hot and Cold Ends of Pumps

part # KRY-GPL226CART





part # KRY-CARGUN

General Maintenance Oxygen Safe Grease with Anti-Corrosion Additive

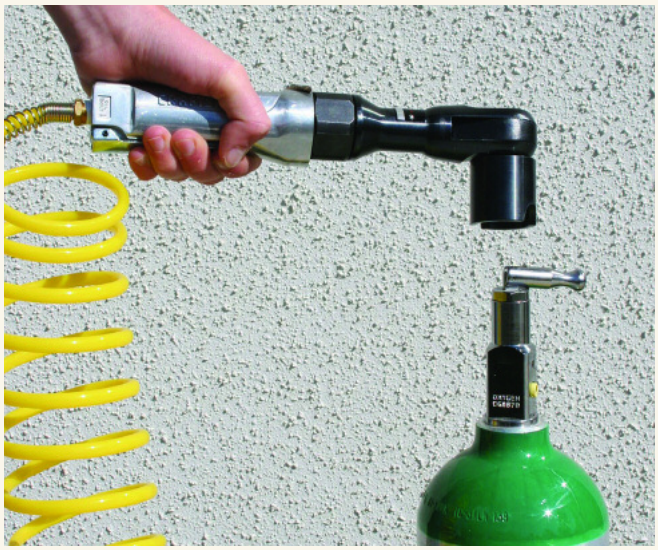
Part #	Description	Size Container
KRY-GPL226CART	Grease Gun Cartridge	1.75 Lb.
KRY-CARGUN	Grease Gun H.D.	each

KRYTOX GREASE USES

Krytox GPL-102 Oil

For use in air tools or o-ring seals around oxygen.

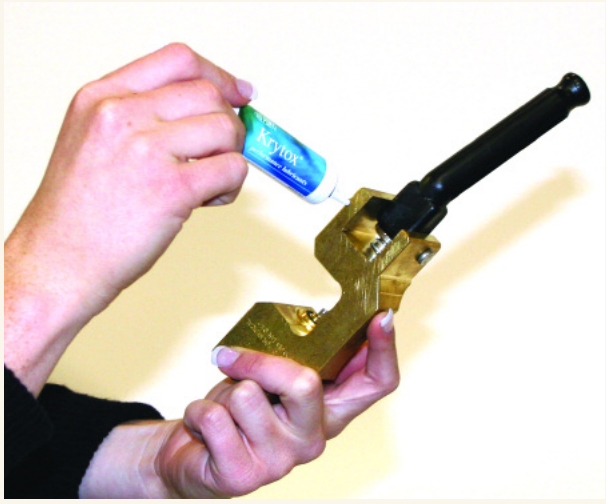
Part # KRY-GPL102.05kg
Package in a convenient .05 kg size container.



Krytox GPL-203 Grease

For use on medical o-ring seals such as the QF-H870 fill connectors or the QF-540 connectors. Can also be used on medical fill racks for general lubrication.

Part # KRY-GPL2032OZ
Part # KRY-GPL2038OZ
Larger sizes available upon request.



Krytox GPL-226 Grease

Can be used on such things as metal to metal surface in contact with liquid oxygen or compressed oxygen. Liquid cylinder casters, cylinder valve stems, for use where moisture might be present.

Part # KRY-GPL2262OZ
Part # KRY-GPL2268OZ
Larger sizes available upon request.

PASTES AND GREASE

TEFLON PASTE AND TAPE

Oxygen Safe, Chemically Inert, and Odor Free

FORMULA-8 is used by thousands of welding and general supply companies and equipment manufacturers worldwide.

IDEAL APPLICATIONS FOR TEFLON PASTE

- Oxygen cylinders to eliminate leaks
- Fine instrument threads
- Oxygen systems below 125˚ C
- Valves on bottled gases

Teflon Paste

Part #	Description	72+	24+	1+
Oxy-Teflon 8	Teflon Paste	13.54	15.40	17.35

Green Oxygen Teflon Threaded Seal Tape

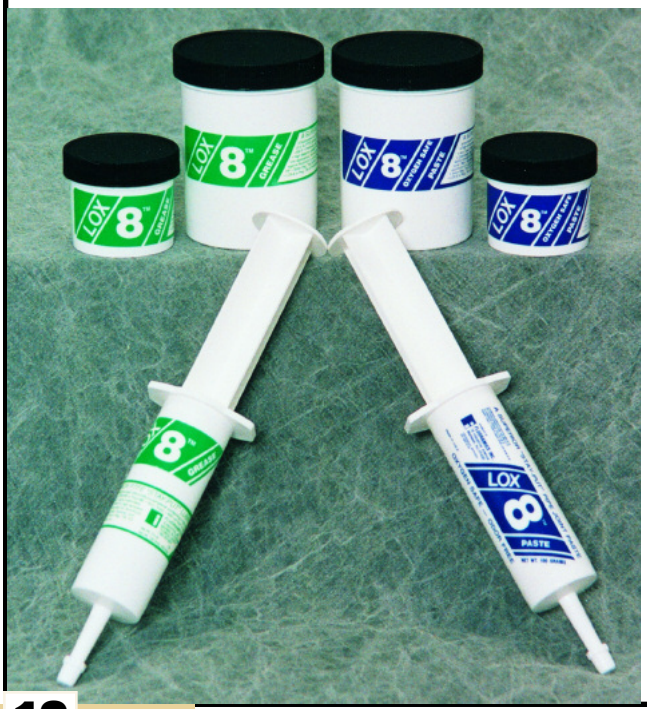
Green Teflon Tape

Part #	Description
TAPE-2-GREEN	1/2″ x 520″ Green Teflon Tape
TAPE-34-GREEN	3/4″ x 520″ Green Teflon Tape

Teflon Tape

Part #	Description
Tape-1	1/4″ Teflon Tape
Tape-2	1/2″ Teflon Tape
Tape-34	3/4″ Teflon Tape
Tape-3	1″ Teflon Tape
Oxy-Teflon 8	Teflon Paste

LOX-8 PASTE AND GREASE



***LOX-8 Paste & Grease** has met the requirements for (BAM) testing. It is odorless, non-corrosive, green tinted, and hydrophobic (waterproof). It is totally non-migrating and remains where it is applied. LOX-8 is ideal, even after long periods of time, where repetitive assembly and disassembly are required.*

APPLICATIONS

- Assembly lubricant
- Breathing apparatus
- Cryogenics
- Hospitals: oxygen and nitrous oxide systems
- Instruments
- Medical equipment
- Thread sealants
- Welding *and Many other industrial uses*

Grease

Part #	Description
Oxy-8 Lox G3.5	3.5 oz. Grease
Oxy-8 Lox G16	16 oz. Grease
Oxy-8 Lox GP	Plunger 3.5 oz. Grease

Paste

Part #	Description
Oxy-8 Past	3.5 oz. Paste
Oxy-8 Past 16	16 oz. Paste
Oxy-8 P Past	3.5 oz. Plunger

OXYGEN COMPATIBLE OC FIVE PASTE AND OC SEVEN GREASE

Solutions for critical and demanding applications where no flammability, compatibility with oxygen and resistance to aggressive chemicals are essential.

OC Five Paste and ***OC Seven Grease*** are blended formulations consisting of PTFE particles and Halocarbon® oil, producing a superior sealant that is chemically inert and environmentally safe. Both products have been tested and certified by BAM for gaseous and liquid oxygen service.

OC Five and ***OC Seven*** can be used in High Vacuum 10-7 Torr applications where exposure to corrosive gases is probable. They are superior lubricants which provide leak tight sealing in a wide range of vacuum requirements. These off-white homogenous grease and paste formulations provide unique sealing and lubricating solutions, as their properties remain unaltered over wide temperature ranges – from cryogenic through thermally stable to +450°F. Both are non-flammable, non-migrating, non-toxic, odorless and waterproof as well as anti-corrosive, anti-galling, anti-seize, dielectric and lubricating.

Cost effective for liquid oxygen, liquid nitrogen, cryogenic and vacuum applications to prevent and reduce component and equipment failures, maintenance or downtime.

Available in 2 oz. (57 gram) and 16 oz. (454 gram) jars with resealable lid for ease of use and storage.

Not recommended for aluminum against aluminum applications. Do not use with concentrated alkalis, fluorine *(liquid)* or chlorine trifluoride *(liquid)*.

OC Five Paste and OC Seven Grease

Part #	Description
OXY-OC5-2OZ	OC Five Paste, 2 oz. Jar
OXY-OC5-16OZ	OC Five Paste, 16 oz. Jar
OXY-OC7-2OZ	OC Seven Grease, 2 oz. Jar
OXY-OC7-16OZ	OC Seven Grease, 16 oz. Jar

9002 83 9	Polychlorotrifluoroethylene
9002 84 0	Polytetrafluoroethylene
68611 44 9	Silicon dioxide aerogel

OC Five Paste and OC Seven Grease *are compatible with many aggressive chemicals including:*

- Acetylene
- Ammonium hydroxide
- Ammonium nitrate
- Ammonium percholrate
- Antimony trichloride
- Boron trifluoride
- Bromine
- Bromine trifluoride (gaseous)
- Calcium hypochlorite
- Carbon dioxide
- Chlorine trifluoride (gaseous)
- Chlorosilanes
- Chlorosulfonic acid
- Chromic acid
- Ethylene
- Fluorine (gaseous)
- Fuming nitric oxide
- Helium
- Hydrogen
- Hydrogen bromide
- Hydrogen fluoride
- Hydrogen peroxide (all concentrations)
- Hydrogen sulfide
- Hydriodic acid
- Iodine
- Muriatic acid
- Nitric acid
- Nitrogen trifluoride
- Oleum
- Oxygen (liquid & gaseous)
- Phosphoric acid
- Potassium perchlorate
- Potassium persulfate
- Propylene oxide
- Silane
- Silicone tetrachloride
- Sodium
- Sodium hydroxide (all concentrations)
- Sulfur trioxide
- Sulfuric acid
- Titanium tetrachloride
- Uranium hexafluoride

PASTE JOINT & THREAD SEALER

OXYGEN COMPATIBLE OC THREE PTFE PASTE JOINT AND THREAD SEALER

Solutions for critical and demanding applications where no flammability, compatibility with oxygen and resistance to aggressive chemicals are essential.

OC Three PTFE Paste Joint and Thread Sealer is an aqueous based PTFE formulation. It is a homogenous white paste that penetrates thread convolutions more effectively, and more safely, than PTFE tape. Tested, approved and certified by BAM for gaseous and liquid oxygen service. Use in extreme temperatures (-400° F to +500° F) and Mid Vacuum specifications to 10-3 Torr. OC Three is especially capable for sealing oxygen and acetylene cylinder valves. Easy to apply from its 4 oz. (113.4 gram) squeeze tube with extended nipple and resealing cap. A superior PTFE thread sealant paste that contains these optimal properties:

Water Soluble / Anti-Galling / Anti-Corrosive
Anti-Seize / Chemically Inert / Non-Toxic
Non-Flammable / Non-Migrating / Odorless

OC Three Joint and Thread Sealer

Part #	Description
OXY-OC3-4OZ	OC Three PTFE Paste, 4 oz. Tube

9002 84 0	Polytetrafluoroethylene
13463 67 7	Titanium dioxide
9003 01 4	Carboxy vinyl polymer
7732185	H2O (water)

OC Three *is compatible with many aggressive chemicals including:*

Acetylene
Aluminum chloride
Ammonium nitrate
Ammonium percholrate
Antimony trichloride
Bromine
Calcium hypochlorite
Carbon dioxide
Chlorosilanes
Chlorosulfonic acid
Chromic acid
Ethylene
Fluorine (gaseous)
Helium
Hydrogen
Hydrogen bromide
Hydrogen peroxide (all concentrations)
Hydrogen sulfide
Hydriodic acid
Iodine
Muriatic acid
Nitric acid
Nitrogen oxides
Oleum
Oxygen (liquid & gaseous)
Phosphoric acid
Potassium perchlorate
Potassium persulfate
Propylene oxide
Silane
Silicone tetrachloride
Sodium hypochlorite
Sodium perchlorate
Sulfur dioxide
Sulfur trioxide
Sulfuric acid
Titanium tetrachloride

RMI RATERMANN MANUFACTURING, INC.

Krytox® Performance Lubricants Product Overview

Compatible with Oxygen Service

Low-Temperature Greases

Krytox® grades formulated with low viscosity oils can be used at temperatures as low as –57°C (–70°F).

Valve Lubricants

Krytox® is used in all types of valves to lubricate moving parts, seal connections, and packing and to protect surfaces from corrosion and degradation. Krytox® lubricates the valve packing and allows it to expand and contract without binding, reducing leakage around the stem. Valves operate more smoothly because Krytox® eliminates sticking and jumping. It is used on safety relief valves to prevent sticking and overpressurization.

O-Ring/Plastic/Rubber Lubricants

Krytox® lubricants for seals and gaskets material do not cause cracking or swelling and are compatible with all plastic and synthetic rubber material.

High-Vacuum Greases

A special low vapor pressure Krytox® oil is used to formulate a grease for high-vacuum applications. It is also useful for sealing laboratory glassware connections and as a thread lubricant/sealant.

Vacuum Pump Fluids

Krytox® vacuum pump fluids are used in applications where conventional vacuum pump oils cause safety, waste disposal, and maintenance problems. They are nonflammable and reduce the chance of fire in pumps. They are nonreactive and safe to use in oxygen systems. They can replace any competitive PFPE fluid as well as any other type of vacuum fluid. Krytox® fluids do not contain acetal groups, which are susceptible to attack by Lewis acids. This gives Krytox® superior stability as a vacuum pump fluid. Krytox® vacuum fluids are precisely distilled to provide low vapor pressures and give superior performance. In addition, Krytox® fluids are recyclable.

Relative Performance

Many synthetic lubricants show excellent performance in one or more categories, but only Krytox® combines stability, nonflammability, and chemical inertness with outstanding lubrication performance under a variety of conditions.

DUPONT®

The miracles of science™

KRYTOX® OILS & GREASE

Selection of the best lubricant involves analyzing your operating conditions and choosing from the many synthetic and petroleum based products. Most petroleum products begin to degrade before 99°C (210°F) and cease turning at temperatures just below –18°C (0°F). Krytox® synthetic lubricants have operating ranges from <–70 to 316°C (<–94 to 600°F).

Krytox® oils and greases are the products of choice for applications where complete nonflammability, oxygen compatibility, and resistance to aggressive chemicals are requirements. These synthetic lubricants provide superior performance and extended life as lubricants, sealants, and dielectrics.

Cost-Effectiveness

As Table 1 demonstrates, Krytox® lubricants are cost-effective across a wide range of applications, because of their long, useful life relative to traditional hydrocarbons.

Typical Applications

Aerospace
- Bearing Lubricant
- Sealant
- O-Ring Lubricant
- Oxygen Systems

Industrial
- Paper Corrugating Bearings
- Chemical Plant Maintenance
- Valve Lubricant
- High-Temperature Equipment
- Clean Rooms
- Chlorine and Oxygen Service
- Textile Equipment

Automotive
- Bearing Lubricant
- CV Joints
- Weatherstrip Lubricant
- Antilock Braking Systems

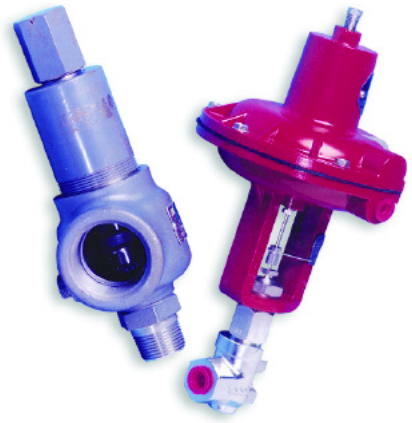
Vacuum Systems
- Vacuum Pump Fluids
- High-Vacuum Greases
- Vacuum System Sealant

Table 1
Life/Cost/Reliability

Application	Typical Hydrocarbon Lubricant	Krytox®
Electric Motor 227°C (440°F), 1,750 rpm	5 days	9 months
Heated Rolls 199°C (390°F), 5,000 rpm	8 months	24 months
Textile Roll 225°C (437°F), 5,400 rpm	1 month	24 months
Pressure Relief Valves	50% failures	Less than 1% failures
Paper Corrugating Machine	$144,000	$3,000

Radiation Stability

Krytox® oils are quite stable to radiation when compared with many materials used as lubricants or power fluids. In general, irradiation of Krytox® oils causes minor depolymerization, with a consequent reduction in viscosity, and formation of volatile products but not solids or sludge. In one test, exposure of a Krytox® sample to an electron bombardment of 107 rad at ambient temperature in air resulted in a viscosity decrease of 8%. The irradiated sample contained no sludge and was unchanged in appearance.



Biological Properties

Krytox® fluorinated oils are biologically inert and are not metabolized. They are not biodegradable and do not support any type of biological growth.

Stability to Lewis Acids

Some depolymerization of all perfluoropolyalkylethers occurs at elevated temperatures in the presence of aluminum trichloride, iron (ferric) or zinc chlorides, and boron trifluoride. These so-called Lewis acids, primarily seen in semiconductor manufacturing environments, have significantly less effect on Krytox® than on competitive fluids, due to its molecular structure. Additional data are available upon request.

Table 6
Oxygen Compatibility of Krytox® Lubricants

Test Type	Temperature, °C (°F)	Oxygen Pressure, MPa (psi)	Impact Energy, J (ft·lb)	Test Result
Ignition in gaseous oxygen[a]	400 (752)	13 (1,886)		No ignition
Pressure drop in gaseous oxygen bomb[b]	99 (210)	0.7 (100)		No pressure drop after 600 hr
Mechanical impact in liquid oxygen	Ambient		98 (72)	No reaction in 20 trials[c,d,e]
Mechanical impact in liquid oxygen	Ambient		122 (90)	No reaction in 10 trials[a]
Mechanical impact in liquid oxygen	Ambient		736 (543)	No reaction in multiple trials[f]

a British Specification 3100.
b American Society for Testing and Materials D942.
c Marshall Space Flight Center Specification 106B.
d National Aeronautics and Space Administration Handbook, 8060.1B, Test 13, Part 1.
e American Society for Testing and Materials D2512.
f West German Federal Institute for Materials Testing (BAM), 8104-411.

KRYTOX® OILS & GREASE

Compatibility with Elastomers and Plastics

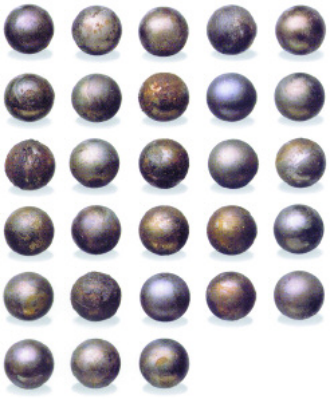
Krytox® is compatible with all elastomeric seal materials and engineering plastics. The limiting factor when using Krytox® with any material is the thermal stability of the elastomer or plastic.

Krytox® performance lubricants are compatible with the following common elastomers and plastics:

Fluorosilicone
Ethylacrylate
Methyl Silicone
Viton® A Fluoroelastomer
Urethane
Hypalon® Synthetic Rubber
Hytrel® Polyester Elastomer
Butyl 325
Neoprene WRT
Nycar 100 (Buna N)
EPT, Peroxide Cure
Nordel® Hydrocarbon Rubber
Delrin® Acetal
Zytel® Nylon
Vespel®
Teflon® Fluoropolymer
Kalrez® Fluoroelastomer*

** 15–20 vol% swelling at high temperatures when immersed.*

Nine months worth of bearings.



Nine months worth of bearings with 18¢ worth of Krytox®.

Compatibility with Metals

Because of their low surface tensions, Krytox® lubricants easily wet metallic surfaces. Krytox® lubricants are chemically inert and therefore have no adverse effect on metals when the temperature is below 288°C (550°F). Above 288°C (550°F), many alloy steels, stainless steels, and other metals such as aluminum alloy, titanium alloy, nickel alloy, and cobalt alloy can be used with Krytox®.

Compatibility with Oxygen

At elevated temperatures and pressures, perfluoroalkylpolyethers are highly resistant to attack by gaseous and liquid oxygen. As a result, Krytox® fluorinated oils have become preferred lubricants in the oxygen manufacturing industry and in those industries that use oxygen.

Krytox® oils do not react with gaseous oxygen under shock loading or with liquid oxygen (LOX), nitrogen tetroxide, or inhibited red fuming nitric acid in impact tests. LOX impact tests were conducted in accordance with Marshall Space Flight Center MSFC-Spec-106B. Other impact tests conducted at 214 J/cm2 (200 ft·lb/in2), according to the method described in ASTM Bulletin 250, also show no reaction.

Krytox® lubricants have also been evaluated by the West German Federal Institute for Materials Testing (Bundesanstalt fuer Materialpruefung, BAM) for reactivity with gaseous and liquid oxygen under pressure. **Table 6** shows oxygen compatibility of Krytox® lubricants.