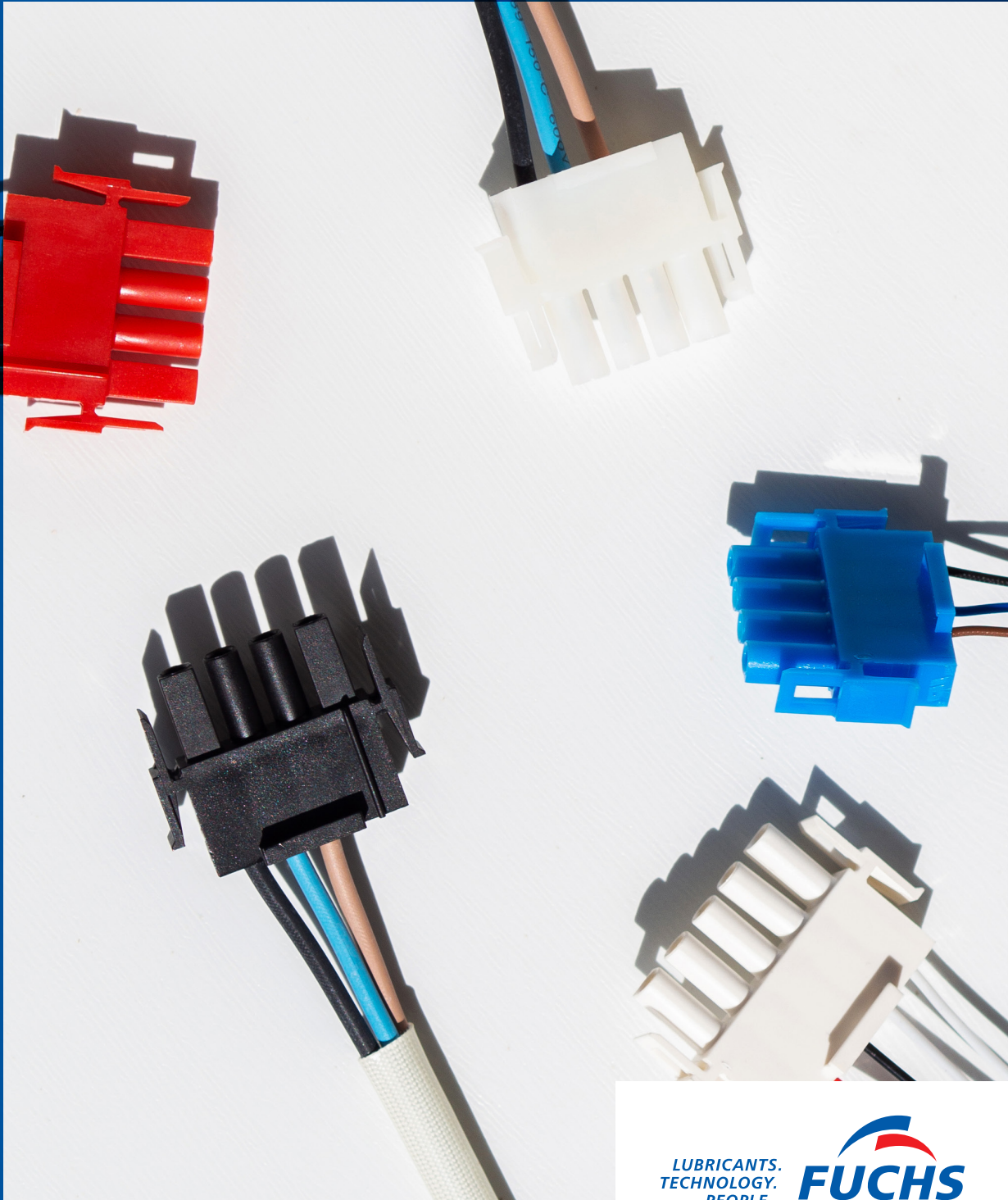


# **FUCHS** Special Applications

## Specialty Lubrication Solutions for Electrical Contacts & Battery Terminals



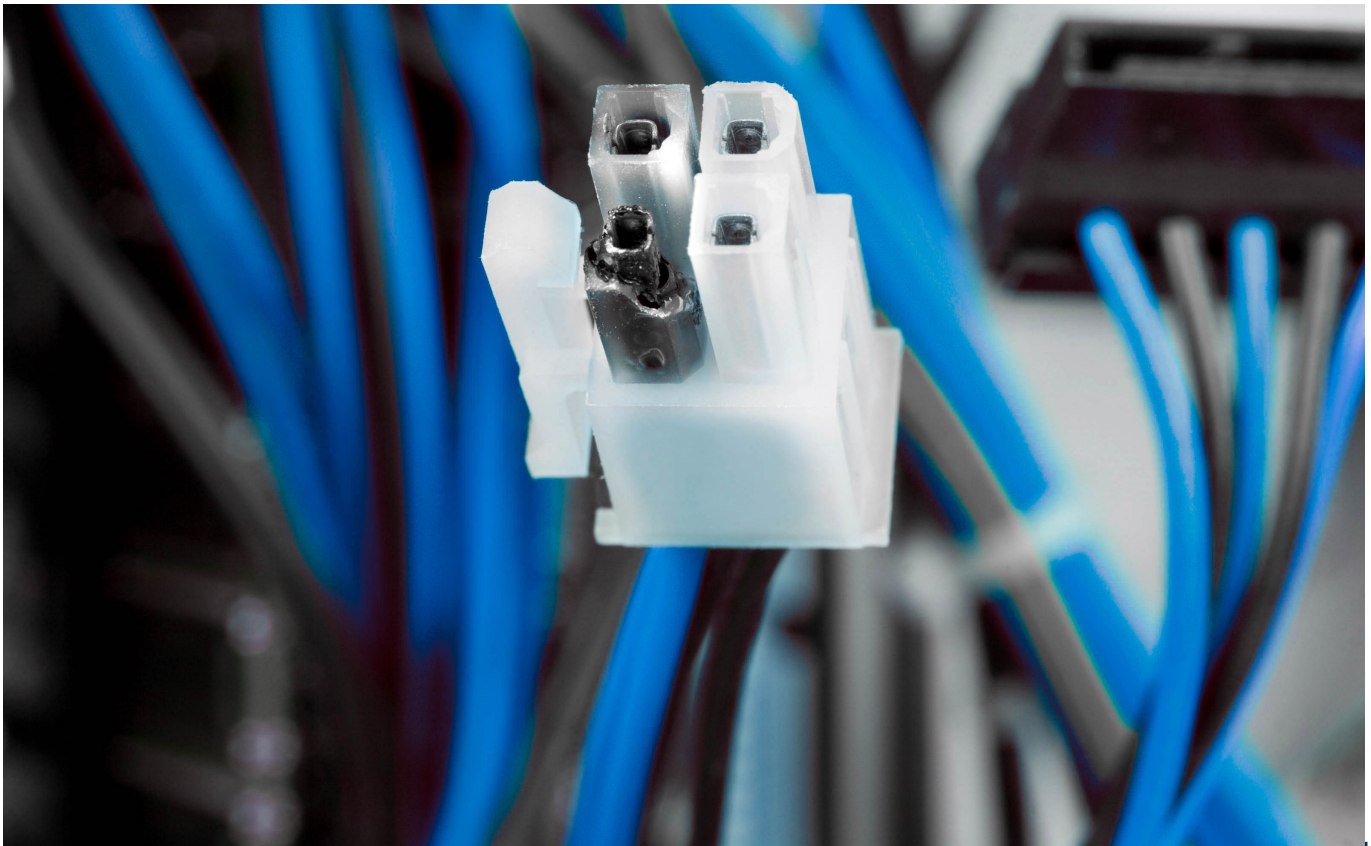
LUBRICANTS.  
TECHNOLOGY.  
PEOPLE.



**MOVING YOUR WORLD**

# Improving Electrical Reliability

The future is electric. This is due in large part to the proliferation of smart, environmentally friendly electric technologies that send more signals, process more data, and make more decisions, than ever before. These technologies are supported from dozens to hundreds of electrical connections that each represent a potential failure point within the system. Electrical contacts are everywhere from Automotive to Wind to Power Tool applications. Failure of electric components can cause problems ranging from nuisance to increased warranty costs to critical safety problems. Lubricants are often used to prevent common electrical failures including short circuits, open connections, and increased resistance. By preventing fretting wear, protecting against corrosion, improving water resistance, and reducing mating force, connector grease can improve the reliability of electrical components and extend their functional life.



Automotive



Trucking



Agriculture



Wind



Power Tools

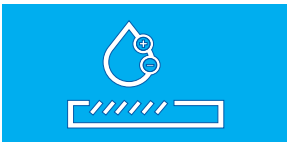
# Top 4 Connector Failures



## Prevent Fretting Wear

Fretting corrosion is one of the leading causes of connector failure and yet many still remain unaware of what it is or how it can be prevented. Fretting corrosion is the result of micromotion caused by vibration and/or thermal expansion due to heating or cooling cycles.

These micromovements wear down through the metal coatings into the base material that then becomes oxidized. As this oxide layer builds up and increases, the oxide film acts as an insulator between the contacts which creates an open circuit resulting in voltage drop across the terminal and ultimately, power failure or signal loss. To minimize fretting wear and keep oxidation at bay, the implementation of a connector grease is key. Connector grease has two primary benefits. First, the grease reduces physical wear between the connecting surfaces as they undergo micromotions and fretting wear. This helps to preserve the layered coatings on the connectors, designed to prevent oxidation and minimize resistance. Second, they insulate the system from the surrounding environment, preventing the build-up of insulative oxide layers which are ultimately responsible for resistance increase and signal loss.



## Protects Against Corrosion

When a contact corrodes, insulative oxides form on the terminal surface which results in increased resistance, signal loss and component failure. The corrosion can also be conductive and builds up to a point where it bridges the distance between two terminals and creates a short circuit.

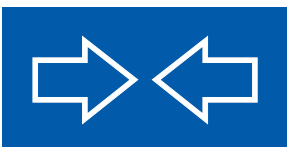
Even with specially designed housings, there is a risk that dust, dirt, or another form of debris could find its way to the contact pin. When this happens, it can interfere with conductivity and lead to a connection that is not solid. Harsh chemicals can also corrode the metal surface and eat away at the pin's metal plating.



## Improve Water Resistance

When connectors are not properly protected against moisture and water intrusion, the contact surface can corrode over time or even cause an instantaneous short circuit. Moisture can take the form of water, detergents, humidity, or salt spray. To protect connectors against water,

many engineers design protective housings to keep out moisture. This adds extra time and cost to the design process and may make the connector hard to access if failure were to occur. Connector grease is a cost-effective solution to protect the contact surface from moisture and environmental corrosion. A common misconception surrounding connector grease is that it absorbs water. Connector grease repels water from the connector surface. Because it is hydrophobic, connector grease stays in place rather than being washed away over time. Additionally, connector grease also prevents current leakage in conductive environments such as water to ensure consistent connectivity.



## Reduce Mating Force

Increased mating force can cause misalignment during assembly and lead to an incomplete connection or damage to terminals. Increased mating force can cause misalignment and/or wear at the metal plating. For multi-pin connectors, mating forces increase significantly which

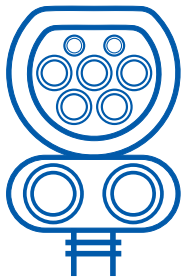
can create ergonomic and safety issues during assembly. A thin film of lubricant reduces friction to ease mating force by as much as 80 percent.



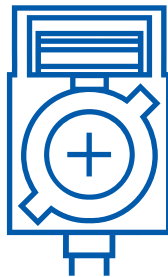
# Types of Electrical Components

## Electrical Contacts

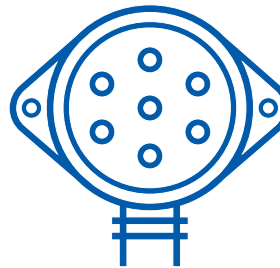
Multipin connectors range in size. Each contact pin requires a certain mating force, the more pins (bigger the connector), the more force that is required to mate them, which can cause wear and ergonomic issues. They are also at risk for fretting corrosion during their storage and operation. USB connectors experience more frequent insertions than other types of connectors. This can lead to more contact wear if not properly lubricated. Like the multipin connectors, USB connectors are also exposed to fretting corrosion during storage and operation. Condensation or moisture can easily pool on the flat surface of a PCB and cause a short circuit. Dirt can also gather and corrode the PCB contacts over time. Our lubricants can be used on a variety of electrical components and with a variety of metals including gold, silver, tin, and copper.



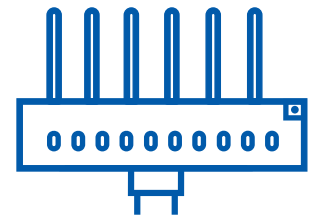
CCS



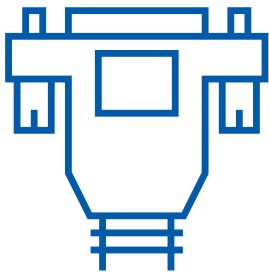
FAKRA Type C



7-Pin



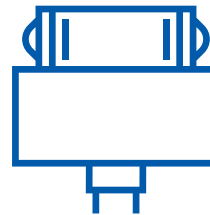
6-Pin Connector



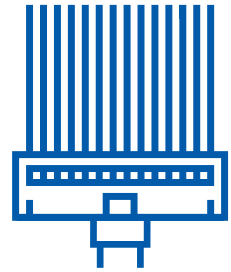
DVI Cable



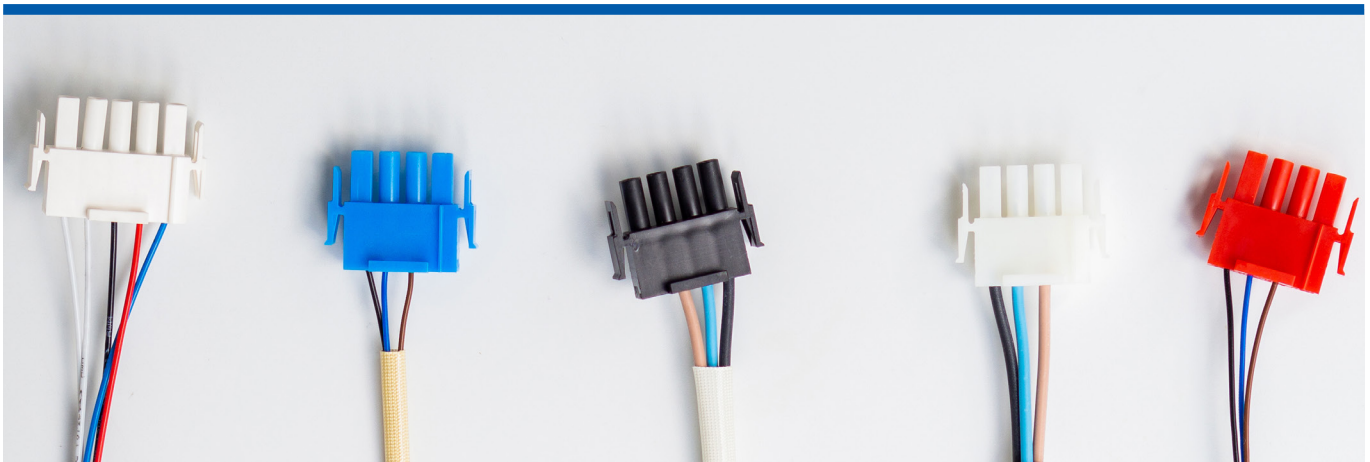
USB Cable



30 Pin Connector

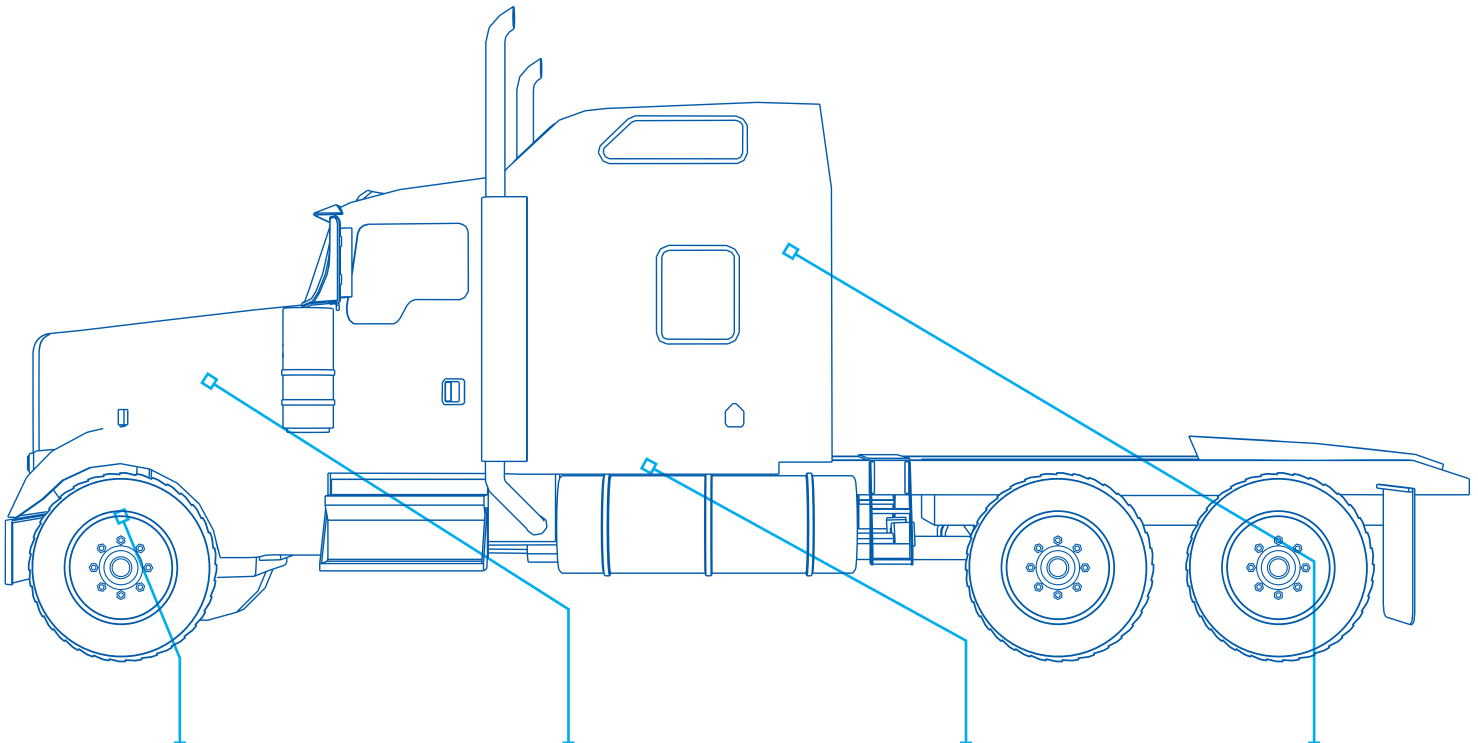


Multi-Pin Connector



## Exposed Terminals

Exposed terminals are often found in automotive, power tool, and heavy-duty trucking applications where environmental factors can impact electrical reliability. Exposed terminals lack a protective cover that can expose terminals to salt, dirt, and other substances that can corrode the terminal surface and create either an open connection or a short between positive and negative terminals. Moisture intrusion, like road spray, can have a more immediate effect and cause an instantaneous short circuit as well. Compared to mineral-oil based solutions, specialty grease from FUCHS has anti-corrosive properties that seals the exposed surface to help OEMs extend the life of their battery, starter and alternator terminals, and ground straps.



### BELOW CAB FLOOR

- Batteries
- Chassis Power Distribution Module
- Battery Disconnect Switch

### ABOVE ENGINE CROSS MEMBER (INSIDE RAIL)

- Alternator
- Starter
- Frame/Engine Grounds

### BELOW ENGINE CROSS MEMBER (OUTSIDE RAIL)

- Horn

### ABOVE CAB FLOOR

- Antenna Grounds



## Connector Lubricants

Our complete line of dielectric greases were designed specifically to address application requirements for contact protection, insertion force, sealing, temperature limits, and material compatibility. Our products can also be tested to your specifications upon request.

### NYOGEL 760G

Leading connector grease across several industries with specification at a wide range of leading OEMs. Good fretting corrosion protection and dielectric isolation capabilities. Common connector material compatibility.

### UNIFLOR 8917

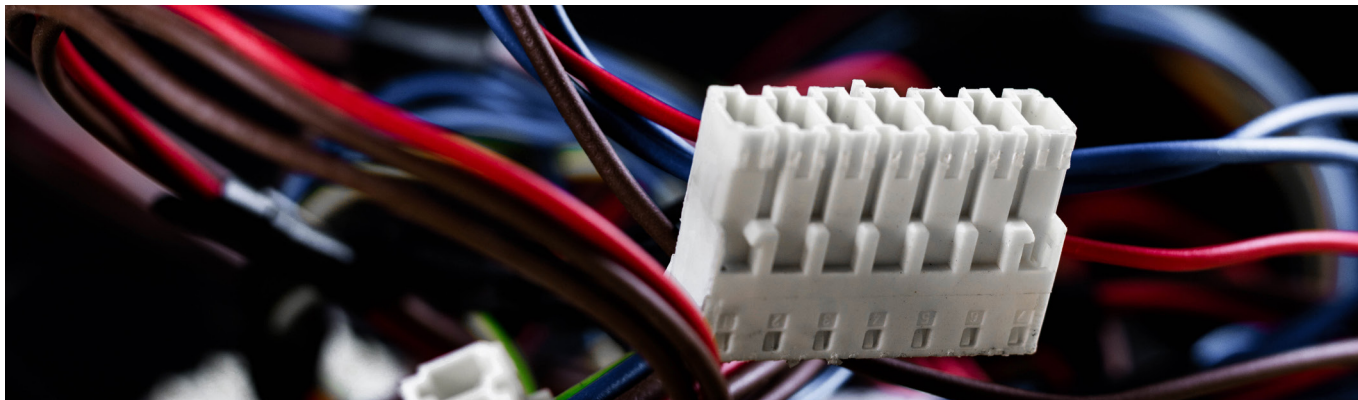
Recommended for applications with high operating temperatures up to 225 °C. Compatible with a wide range of plastics and elastomers. Excellent insertion force reduction.

### RHEOTEMP 768G

Similar performance as NYOGEL 760G, with a higher maximum temperature capability of 175 °C.

## Lubricant Properties

Product	Base Oil	Temperature Range	Kinematic Viscosity		NLGI Grade	Oil Separation 24 h 100 °C	Evaporation 24 h 100 °C	Salt Spray Resistance 750 h
			40 °C	100 °C				
NYOGEL 760G	PAO	-40 to 135 °C	400 cSt	39 cSt	2	1.5%	0.30%	No Corrosion
RHEOTEMP 768G	PAO/AN	-40 to 175 °C	193 cSt	22 cSt	1.5	1.2%	0.20%	No Corrosion
UNIFLOR 8917	PFPE	-70 to 225 °C	88 cSt	27 cSt	2	4.8%	0.05%	Slight Corrosion



# Fretting Wear

FUCHS' proprietary fretting wear test apparatus allows us to simulate fretting conditions to validate the longevity, reliability, and durability of our lubricants. The apparatus uses a magnetic linear actuator which produces oscillations in a frequency range of 1Hz to 1,000Hz, amplitudes of 1-200µm, and with a continuous load of 50lbs and 150lbs of peak force. To ensure accurate position control, an absolute encoder is utilized for closed loop motion control to keep the amplitude resolution within 1 µm. The expected life of our lubricants is determined by their failure point, when enough oxidized wear debris has been created and the contact resistance increases to a level where continuity in the contact is lost. This modular apparatus allows us to test a variety of components and geometries to more accurately assess how our lubricants will perform in your application.



Lubricated with NYOGEL 760G

6.7 MM Cycles

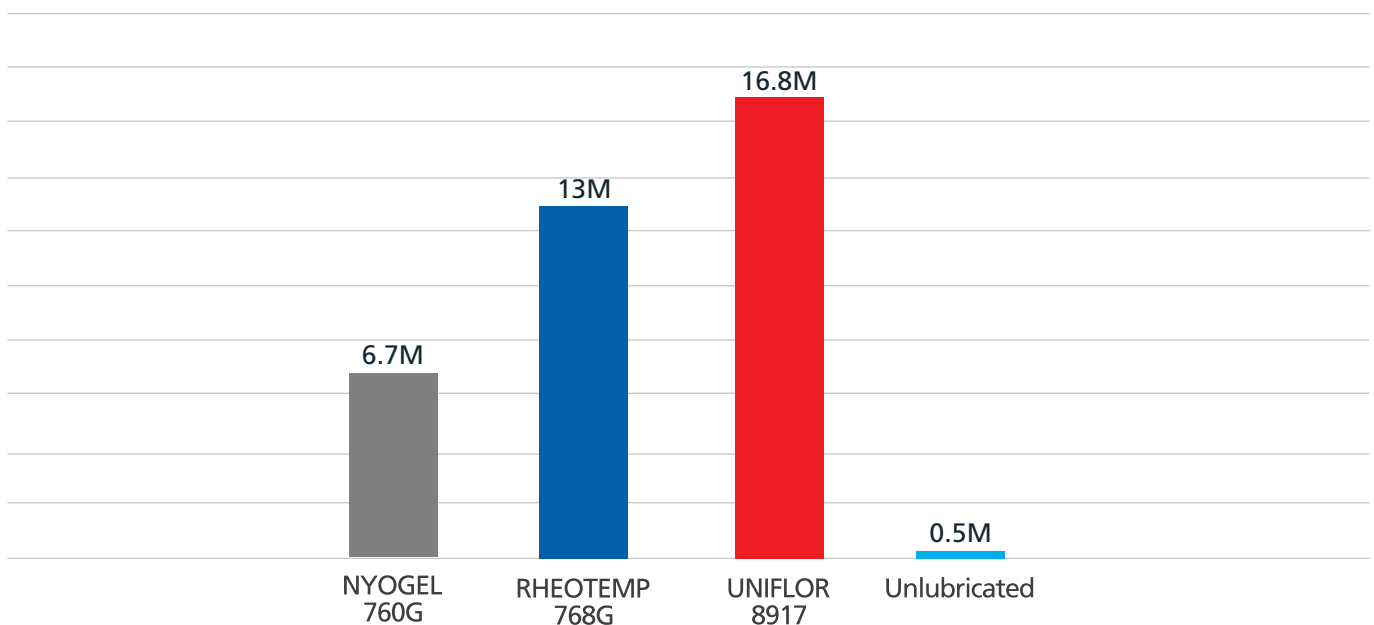


Unlubricated

0.5 MM Cycles

**Test Conditions:** 2.8mm APEX Copper-Tin Terminals, 10Hz, 100 microns, 50% Failure Value (CTM)

## Fretting Cycles to Failure Point



## Innovative lubricants need experienced application engineers

Every lubricant change should be preceded by expert consultation on the application in question. Only then the best lubricant system can be selected. Experienced FUCHS engineers will be glad to advise on products for the application in question and also on our full range of lubricants.

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