

NSF HX-1 Registered
Additives & Synthetic Base Oils
For Lubricants with Incidental Food Contact

King Industries offers a selection of high performance additives and synthetic base stocks that comply with the FDA 21 CFR 178.3570 for use in lubricants with incidental food contact. These products are NSF approved as HX-1 ingredients for use in H1 lubricants and are Halal and Kosher certified.





Kosher & Halal
Approvals 



NSF HX-1 Registered Products

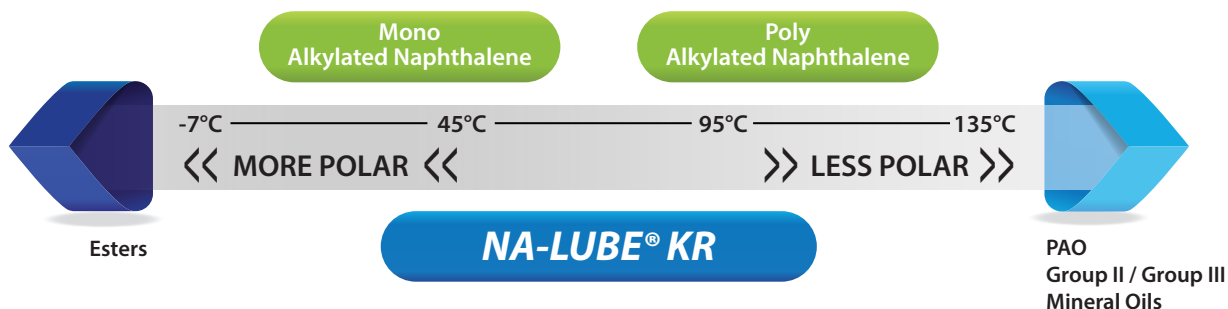
	Description	Maximum Allowable Treat Level	NSF HX-1 Registration #
Alkylated Naphthalenes, pg. 3			
NA-LUBE® KR-006FG	Exceptional hydrolytic, thermal and thermo-oxidative stability and excellent solvency.	100%	143717
NA-LUBE® KR-015FG	Exceptional hydrolytic, thermal and thermo-oxidative stability and excellent solvency.	100%	140436
NA-LUBE® KR-029FG	For higher temperature applications. Exceptional hydrolytic, thermal and thermo-oxidative stability and excellent solvency.	100%	141220
Antioxidant, pg. 4			
NA-LUBE® AO-142	A liquid, easy to handle, alkylated diphenylamine antioxidant.	0.5% by wt.	140584
Rust Inhibitor, pg. 5			
NA-SUL® CA-770FG	A premium rust inhibitor that provides excellent demulsibility and filterability.	10% by wt.	143718
AW/ Rust Inhibitor, pg. 5			
NA-LUBE® AW-6400FG	A multifunctional additive that offers anti-rust, antiwear and extreme pressure properties.	0.5% by wt.	141635
AW/ EP Agent, pg. 6			
NA-LUBE® ADTC	A unique ashless dithiocarbamate offering extreme pressure, antiwear and antioxidant properties.	0.5% by wt.	157962
NA-LUBE® AW-6509	An ashless antiwear and extreme pressure additive.	0.5% by wt.	149707
YMD/ Copper Corrosion, pg. 7			
K-CORR® NF-200	An ashless, yellow metal deactivator / corrosion inhibitor.	0.1% by wt.	141124
Fully Formulated Package, pg. 7			
NA-LUBE® BL-1300FG	A multifunctional rust and oxidation inhibiting additive package for R&O oils, compressor oils, hydraulic fluids and gear oils.	2.3% by wt.	145962

NA-LUBE KR alkylated naphthalenes are used to formulate high performance lubricants and greases. They offer outstanding hydrolytic and thermo-oxidative stability and solvency. Typical performance benefits include:

-  Outstanding thermal and thermo-oxidative stability
-  Excellent varnish control and system cleanliness
-  Excellent solvency, dispersancy and seal swell as co-base stock with Group II, Group III and PAO oils
-  May be used at levels “not to exceed the minimum amount required to achieve the desired technical effect”

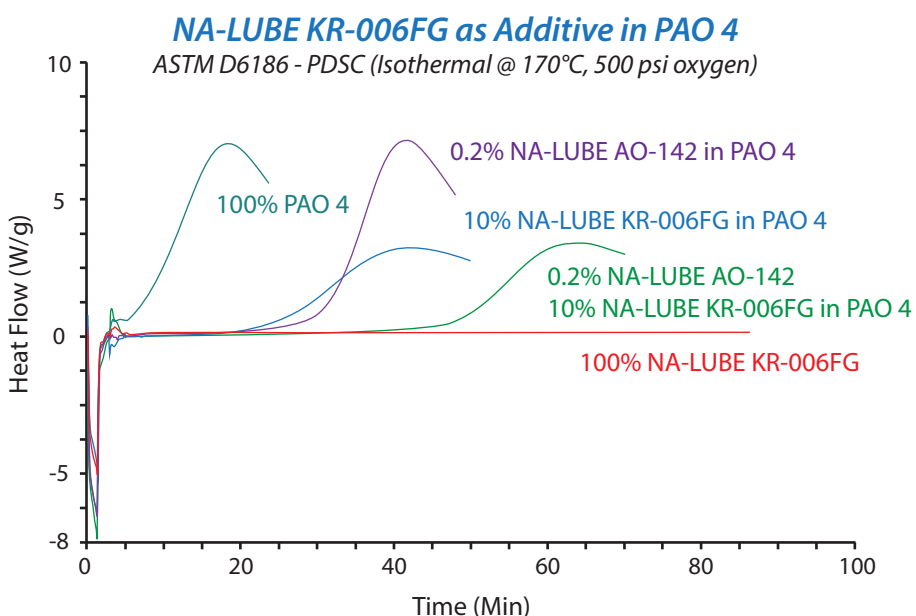
NA-LUBE KR Series Products - Typical Properties

NA-LUBE	Viscosity @ 40°C ASTM D445	Viscosity @ 100°C ASTM D445	Viscosity Index Calculated	Aniline Point ASTM D611	Noack Volatility CEC L40 ASTM D6375	Pour Point ASTM D97	Flash Point ASTM D92
KR-006FG	36 cSt	5.6 cSt	90	42°C	11 wt%	-33°C	236°C
KR-015FG	114 cSt	13.5 cSt	115	94°C	2.2 wt%	-45°C	260°C
KR-029FG	177 cSt	18.7 cSt	119	103°C	1.4 wt%	-26°C	285°C



Shown right and on the next page are PDSC curves demonstrating a benefit of employing NA-LUBE KR as co-base stocks. Below, NA-LUBE KR-006FG alone shows no response to isothermal PDSC at 170°C after 2 hours. The oxidation induction time (OIT) for PAO 4 alone is less than 10 minutes under the same conditions. Adding 10% KR-006FG to the PAO 4 improves the OIT to 30 minutes and reduces the maximum heat flow to about half.

With the addition of NA-LUBE AO-142 antioxidant, both of the curves are shifted to a higher OIT and the modified PAO continues to have a reduced exotherm. The KR-006FG modified system continues to show improved performance.

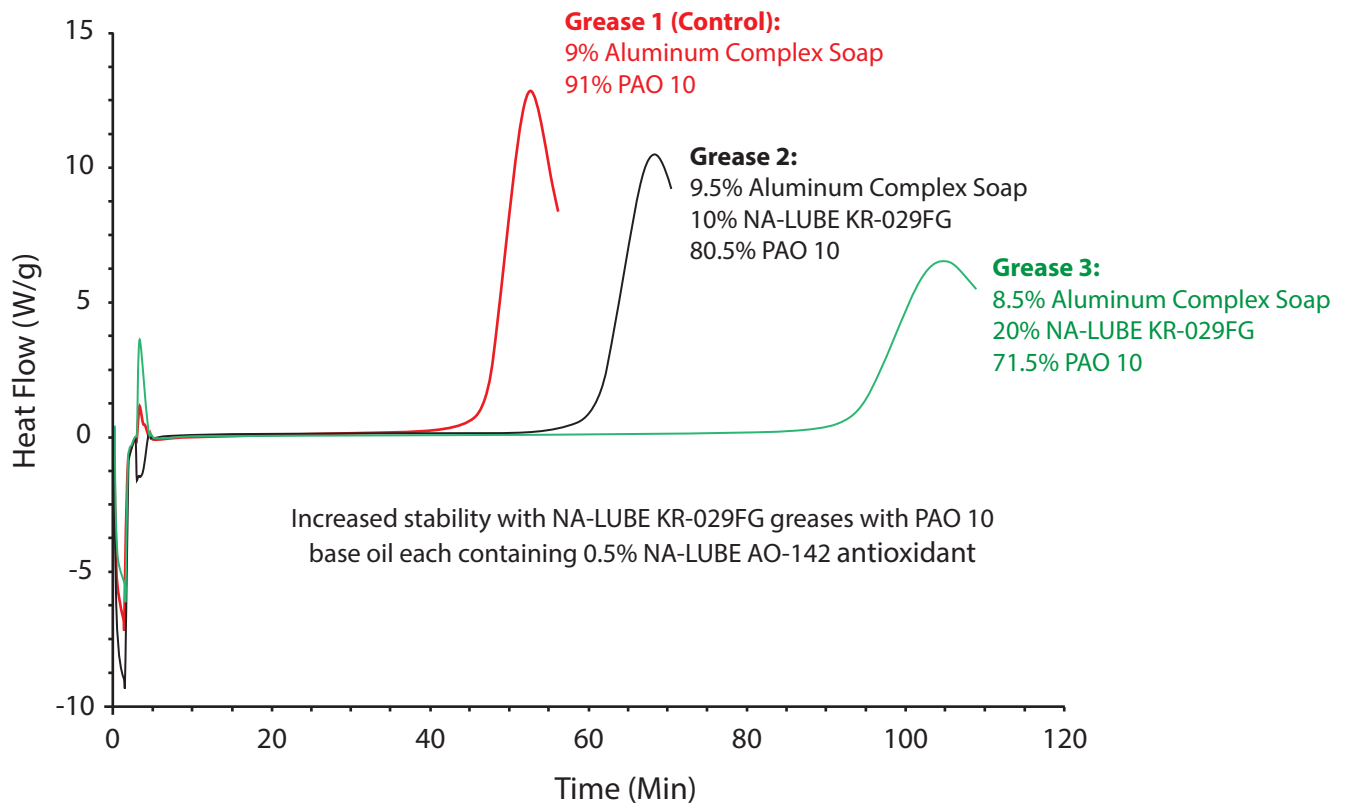


The **NA-LUBE KR**s can improve the thermo-oxidative stability of high performance H-1 greases.

Shown below are PDSC results for food grade aluminum complex greases* made with all PAO base fluid, 10% KR-029FG and 20% KR-029FG. The greases made with the alkylated naphthalene additions showed superior thermo-oxidative resistance, resulting in increased induction times and reduced heat flows.

NA-LUBE KR-029FG as Additive Base Fluid in Al-Complex/PAO Grease

ASTM D5483 - PDSC (180°C, 500 psi oxygen)



* Greases courtesy of FedChem, LLC

NA-LUBE® AO-142

NA-LUBE AO-142 is a liquid alkylated diphenylamine antioxidant soluble in a wide range of HX-1 base fluids. It may be used up to 0.5% in food grade applications.

Shown in the table below are typical RPVOT (ASTM D2272) results for 0.2% addition to several HX-1 base fluids.

HX-1 Base Fluid with 0.2% NA-LUBE AO-142

	PAO 10		White Oil		Water Soluble PAG		NA-LUBE KR-029FG		Polyol Ester	
	0.2% AO-142		0.2% AO-142		0.2% AO-142		0.2% AO-142		0.2% AO-142	
RPVOT (ASTM D2272) Minutes	55	268	31	141	15	40	76	905	115	470

NA-SUL CA-770FG is an unique, neutral calcium alkyl naphthalene sulfonate rust inhibitor for petroleum and synthetic lubricants and rust preventive fluids. It provides excellent demulsibility and filterability and is compatible with a wide range of additives and base stocks.

NA-SUL CA-770FG is especially effective for greases. High allowed use levels can impart salt water rust protection when tested according to ASTM D5969 and ASTM D6138 with 5% synthetic sea water.

- ✔ Passes ASTM D665B Steel Rust Test in white mineral oil and PAO at 0.1- 0.15% treat level
- ✔ Excellent hydrolytic stability
- ✔ Imparts excellent demulsibility
- ✔ Passes stringent wet filtration requirements
- ✔ May be used up to 10% for more severe rust requirements

*Formulators
note*

*Not recommended in combination
with amine phosphates.*

NA-LUBE AW-6400FG is an ashless, multifunctional additive that offers anticorrosion, antiwear and EP properties. It is especially suited for food grade lubricants that require rust protection and high load capability (FZG) at low treat levels.

- ✔ Easy to handle, light color liquid
- ✔ Soluble in all common food grade base stocks
- ✔ Passes ASTM D665B at 0.5% in most base fluids

HX-1 Base Fluids with 0.5% NA-LUBE AW-6400FG

	PAO 10	White Oil	Water Soluble PAG	NA-LUBE KR-015FG	Polyol Ester
Four Ball Wear (ASTM D4172)					
30 kgf (mm)	0.4	0.4	0.5	0.4	0.4
40 kgf (mm)	0.5	0.5	0.6	0.4	0.4

White Mineral Oil, ASTM D665B Rust Test



0.5% **NA-LUBE ADTC**
0.2% **NA-LUBE AO-142**



0.5% **NA-LUBE AW-6400FG**
0.5% **NA-LUBE ADTC**
0.2% **NA-LUBE AO-142**

NA-LUBE® ADTC

NA-LUBE ADTC is a high performance ashless multifunctional additive offering extreme pressure, antiwear and antioxidant properties.

- ✔ Excellent FZG performance at low treat
- ✔ Outstanding demulsibility
- ✔ Excellent thermal stability



NA-LUBE® AW-6509

NA-LUBE AW-6509 is an ashless white powder. It is a multifunctional antiwear and extreme pressure additive, especially suited for formulating lubricants that require high temperature performance.

- ✔ Phosphorus and sulfur containing to impart AW and EP
- ✔ Excellent thermal and hydrolytic stability
- ✔ Non-aggressive to copper
- ✔ Synergistic with NA-LUBE AW-6400FG in FZG performance



K-CORR NF-200 is a yellow metal deactivator that protects copper and copper alloys against corrosion. K-CORR NF-200 also enhances the oxidation stability of food grade lubricants and greases when used in combination with HX-1 food grade antioxidants, such as NA-LUBE AO-142.

K-CORR NF-200 is recommended for formulating high performance food grade circulating and steam turbine oils, hydraulic oils, vacuum oils and industrial gear oils, as well as greases.

- ✔ Synergistic with primary and secondary antioxidants
- ✔ Excellent thermal and hydrolytic stability
- ✔ Good demulsification properties
- ✔ Outstanding solubility in mineral oil and synthetic base stocks
- ✔ Good compatibility with other additives
- ✔ Easy to handle liquid

White Mineral Oil
ASTM D130 Copper Corrosion
 24 hours at 100°C



0.5% Ashless Dithiocarbamate
 0.2% Liquid DPA Antioxidant



0.05% **K-CORR NF-200**
 0.5% Ashless Dithiocarbamate
 0.2% Liquid DPA Antioxidant

NA-LUBE BL-1300FG is a rust and oxidation inhibiting additive package with antiwear performance designed for use in the food processing industry. Depending on the application and the food grade base oil used, the recommended treat level is 1.0% to 2.3% by weight.

- ✔ Recommended for use in R&O oils, compressor oils, hydraulic fluids and industrial gear oils
- ✔ Effective in most food grade base oils
- ✔ Outstanding oxidation and corrosion protection
- ✔ Excellent demulsibility and wet filtration
- ✔ Excellent Four Ball Wear and FZG performance
- ✔ Passes the Vickers 104C Vane Pump test at 1.5 % in PAO 8



Notes:

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