



Performance Blends

NA-LUBE[®] BL Series
Ashless Packages for Industrial Lubricants

King Industries, Inc. has been developing and offering high performance additives since 1932. Our technical and marketing teams have been helping customers solve challenging formulating problems with the use of our NA-SUL®, K-CORR® and NA-LUBE® additives.

Awareness of synergies between additives has lead us to develop special blends that incorporate the most desirable features and benefits of a wide range of specialty additives. The **NA-LUBE BL Series** is comprised of high performance, ashless blends and packages for use in premium industrial lubricants.

NA-LUBE® BL Series




R&O	Hydraulic Oil	Compressor/ Hydraulic Oil	Industrial Gear Oil
BL-1208	BL-1232 EL	BL-1200	BL-1208 + AW-6310
	BL-1300FG		KX1323
	BL-1400		

NA-LUBE®

Product Descriptions

R&O, pg. 3	
NA-LUBE BL-1208	General purpose rust and oxidation additive package that offers outstanding antioxidation performance for hydraulic, turbine and circulating oils.
Hydraulic Oil, pg. 4	
NA-LUBE BL-1232 EL	Environmentally friendly multifunctional additive package designed for use in ester-based lubricants. Eligible for the European Ecolabel.
NA-LUBE BL-1300FG	Multifunctional rust and oxidation inhibiting additive package for food grade circulating oils, hydraulic fluids and gear oils.
NA-LUBE BL-1400	Additive package for antiwear hydraulic fluids that can be used to formulate fluids that meet Parker Hannifin (Denison) HF-0, HF-1 and HF-2 requirements.
Compressor/ Hydraulic Oil, pg. 5	
NA-LUBE BL-1200	Multifunctional additive package for use in industrial oils. Offers outstanding performance for use in premium compressor oils.
Industrial Gear Oil, pg. 6	
BL-1208 + AW-6310	Using BL-1208 R&O package plus AW-6310 to formulate gear oils meets AGMA 9005-E02 specifications.
KX1323	Environmentally friendly additive package for use in ester-based gear oils that meets DIN 51517, Part 3. Eligible for the European Ecolabel.

NA-LUBE BL-1208 is a multifunctional, general purpose, ashless R&O additive package for industrial oils. Benefits include:

-  Excellent antioxidation properties
-  Good antiwear and anticorrosion performance
-  Can be used as a building block for formulating lubricant packages for other applications

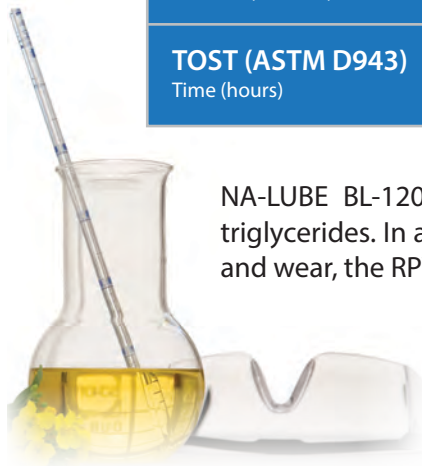
NA-LUBE BL-1208 has been evaluated in API Group I, II, III, and IV base oils at 0.7% by weight. The excellent antioxidation performance shown in the table below varies with the base oil. The results for other significant R&O properties are similar for the four oils:

NA-LUBE BL-1208 R&O Performance in Base Oils

	Group I, II, III, IV
Synthetic Seawater Rust (ASTM D665B)	All pass
Copper Corrosion (ASTM D130) 3 hours, 100°C	1a - 1b
Demulsibility (ASTM D1401)	Separation in 30 minutes max
Four Ball Wear (ASTM D4172) 75°C, 40 kgf, 1 hour, 1200 rpm	0.4 - 0.5 mm scar diameter

NA-LUBE BL-1208 Antioxidant Performance in Base Oils

	Group I	Group II	Group III	Group IV
	With 0.7% NA-LUBE BL-1208			
RPVOT (ASTM D2272) Lifetime (minutes)	600	1,500	1,740	2,200
TOST (ASTM D943) Time (hours)	3,600	>10,000	>12,000	>12,000



NA-LUBE BL-1208 can also be used to formulate general purpose R&O oils based on triglycerides. In addition to the results noted above for rust, copper corrosion, demulsibility, and wear, the RPVOT results for two common vegetable oils are shown below:

NA-LUBE BL-1208 Antioxidant Performance in Vegetable Oils

	Canola Oil	Canola Oil + BL-1208	Soybean Oil	Soybean Oil + BL-1208
Treat Level, %	--	2.2	--	1.8
RPVOT (ASTM D2272) Lifetime (minutes)	14	100	17	290





High oleic content vegetable oils may provide improved oxidation stability. Selective synthetic ester base oils can achieve significant improvement in oxidative stability when used in environmentally friendly fluids. Results are available.

Specialty Packages for Hydraulic Oils

NA-LUBE® BL-1232 EL is an ashless, multifunctional additive package specifically designed for use in ester based systems, including hydraulic fluids. NA-LUBE BL-1232 EL, when used as a single additive, qualifies for use in a final product eligible for the **European Ecolabel** at a concentration up to 1.8% by weight. NA-LUBE BL-1232 EL also qualifies for use in Environmentally Acceptable Lubricants (EALs) for Vessel General Permit (VGP) compliance.

Ecolabel
Compliance



-  Excellent AFNOR and DIN filterability
-  Excellent antiwear and anticorrosion performance
-  Good antioxidation properties
-  Good SRE-NBR seal compatibility






NA-LUBE BL-1232 EL Performance in Saturated Ester

	Specification DIN ISO 15380	Saturated Ester	
		Neat	w/ 1.8% BL-1232 EL
RPVOT (ASTM D2272) Lifetime (minutes)	--	<50	750
Dry TOST (ASTM D943 Modified) Acid # (mg KOH/g) Time (hours)	TAN <2.0 1,000	<0.1 100	0.25 5,880
Vickers 104C Vane Pump Weight loss ring (mg) Weight loss vanes (mg)	120 max 30 max	-- --	4.6 7.6
FZG A/8.3/90 (ASTM D5182) Damage load stage	10 min	--	>12

Food Grade
Approvals



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

-  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

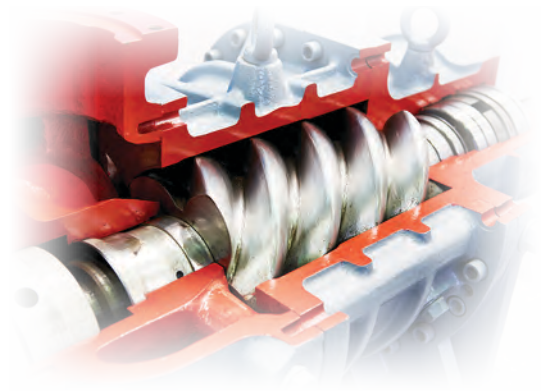


NA-LUBE® BL-1200 offers outstanding performance in compressor fluids, turbine fluids, hydraulic fluids, circulating oils and industrial gear oils.

NA-LUBE BL-1200 Performance




	Group II With 0.75% BL-1200	Group IV
RPVOT (ASTM D2272) Lifetime (minutes)	1,400	1,500
TOST (ASTM D943) Time (hours)	> 7,600	> 7,600

	Group I With 0.75% BL-1200
Vickers 104C Vane Pump Weight loss ring (mg) Weight loss vanes (mg)	13 6



Additional test results are available in Group I, II, III and IV oils.

NA-LUBE BL-1400 is a fully-formulated, ashless additive package for antiwear hydraulic fluids. It can be used to formulate fluids that meet Parker Hannifin (Denison) HF-0, HF-1 and HF-2 requirements.

-  Excellent thermal and hydrolytic stability
-  Good demulsibility
-  High load carrying capacity

NA-LUBE BL-1400 Denison and Vickers Performance in Group I and Group II Oils

	0.6% BL-1400 Group I	0.6% BL-1400 Group II	Most Severe Requirements
Hydrolytic Stability (ASTM D2619) Copper loss (mg/cm ²) Acidity of water layer (mg KOH/g)	0 2.13	0 2.26	Parker Hannifin (Denison) HF-0 0.2 max 4 max
Denison Filterability Procedure A dry (seconds) Procedure B with water (seconds)	169 299	183 292	Parker Hannifin (Denison) HF-0 600 max 2x A max
Vickers 104C Vane Pump Weight loss ring (mg) Weight loss vanes (mg)	2.1 4.1	-- --	SEB 181 222 60 max 15 max

Packages for Industrial Gear Oils






NA-LUBE® BL-1208 can be used as a building block for formulating lubricant packages for other applications, including EP industrial gear oils. The AW/EP booster, **NA-LUBE AW-6310**, can be added to NA-LUBE BL-1208 to fulfill the AGMA 9005-E02 Industrial Gear Oil Specification.

NA-LUBE BL-1208 Formulating Modification for Industrial Gear Oil

	0.7% BL-1208 0.3% AW-6310	AGMA 9005-E02 Specifications
	ISO VG 220	
FZG A/8.3/90 (ASTM D5182) Damage load stage	>12	>12
Gear Oil Oxidation (ASTM D2893) Viscosity increase (%)	2.4	6 max
Demulsibility (ASTM D2711) Procedure B Emulsion (ml) Total free H ₂ O (ml) Water in oil (%)	<0.1 87 0.40	1.0 max 80 min 2% max

Ecolabel Package for Industrial Gear Oils

KX1323 is an environmentally friendly, multifunctional, ashless additive package specifically designed for ester-based industrial gear oils. When used as a single additive with an approved base fluid, the final product is eligible for the **European Ecolabel** listing.

-  Compliance with Ecolabel criteria as a single additive up to 1.8% by weight
-  Excellent antiwear and anticorrosion performance
-  Good antioxidation performance
-  1.8% KX1323 in appropriate saturated ester meets DIN 51517 Part 3
-  FZG A/8.3/90 damage load stage >12



Test Methods

Technical Service

The technical service that we offer to our customers is an important part of our relationships and value of our business. We maintain a broad range of ASTM, DIN and IP testing capabilities and equipment coupled with committed, experienced personnel to assist you in your formulating endeavors. Our performance testing capabilities in our technical service laboratories include:

<i>Test</i>	<i>Method</i>
1,00 Hour Sludge	ASTM D4310
Air Release	ASTM D3427, DIN 51 381
CM Thermal Stability	ASTM D2070
Copper Corrosion	ASTM D130 / D4048, DIN 51 759, IP 154
Demulsibility	ASTM D1401 / D2711, DIN 51 599
DKA Oxidation Stability	CEC L-48-A-95 (B)
FE-8	DIN 51819 / 51819-3
Filterability	DIN ISO 13357, A-TP-02100
Flender Foam	ISO 12152
Foam	ASTM D892, DIN 51 566E, IP146
Four Ball Wear	ASTM D4172, DIN 51350-3, IP 239
Four Ball Weld	ASTM D2783, DIN 51350-2, IP 239
FZG A/8.3/90	ASTM D5182, DIN 51 354, IP 334
Gear Oil Oxidation	ASTM D2893
Hydrolytic Stability	ASTM D2619
Oil Separation, Wire Mesh Cone, Static	DIN 51817, IP 121
Oxidation Stability	IP 48
Panel Coker	In-house
PDSC	ASTM D5483 / D6186
RPVOT	ASTM D2272
SRV	ASTM D6425, DIN 31 834
Steel Corrosion	ASTM D665 (A&B), DIN 51 585 (A&B), IP 135
Timken	ASTM D2782, DIN 51434
TOST	ASTM D943, DIN 51 587

Regulatory

Regulations within our industry plays an important role in sustainability and protection to both individuals and the environment. King Industries embraces regulations and builds on them to offer products that are globally registered, giving customers the security of knowing that our products are properly manufactured, documented and registered around the world.



Compliance



King Industries recognizes that the benefit of conforming to the International Organization for Standards not only ensures efficient business operations but, more importantly, reassures customers that our products are safe, efficient and environmentally friendly. King currently holds three certificates: ISO 9001 for Quality, ISO 14001 for Environmental and OHSAS 18001 for Health and Safety. All ISO systems at King are supported by an active internal auditing program.

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