



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 | Slideway Oil |
|---------|------------------------------------|------------------------------|-----------------------------|--------------|
| BL-1208 | BL-1232 EL BL-1300FG BL-1400 | BL-1200 | BL-1208 + AW-6310 KX1323 | BL-1792 |

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. |
| Slideway Oil, pg. 7 | |
| NA-LUBE BL-1792 | Fully formulated ashless additive package designed for formulating high quality slideway oils for use in the most demanding machine tool applications. |

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

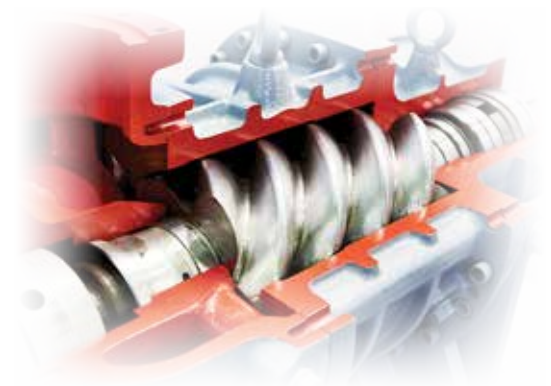


NA-LUBE® BL-1200 offers outstanding performance in compressor fluids, turbine fluids, hydraulic fluids, circulating oils and industrial gear oils.

NA-LUBE BL-1200 Performance




| | Group II | Group IV |
|---|--------------------|----------|
| | With 0.75% BL-1200 | |
| 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 | 0.6% BL-1400 | Most Severe Requirements |
|--|--------------|--------------|---|
| | Group I | Group II | |
| 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



NA-LUBE BL-1792 is a fully formulated, ashless additive package designed for formulating high quality slideway oils for use in the most demanding machine tool applications. Bench tests have shown that slideway oils based on NA-LUBE BL-1792 exhibit good demulsibility performance in a modified ASTM D1401 test when distilled water is replaced with fully formulated, commercially available water-based metalworking fluids (emulsions).

-  **Excellent friction control at a low treat level**
-  **Coefficient of friction and demulsibility tested in collaboration with SKC (Schmidt) Germany**
-  **Excellent compatibility (de-emulsification) with water-based metalworking fluids (coolants)**

**NA-LUBE BL-1792 Performance
in ISO VG 220 Oil**

| | 1.16% BL-1792 |
|--|--|
| Demulsibility (ASTM D2711) Emulsion (ml) Total free H ₂ O (ml) Water in oil (%) | 0 82.5 0.14 |
| Coefficient of Friction Determined by SKC Germany GG25 - GG25 (f ₀) SKC 3 - GG25 (f ₀) | 0.117 0.093 |
| FZG A/8.3/90 (ASTM D5182) Damage load stage | >12 |



Technical Service

Technical Service Test Methods

Our experienced Technical Service Department is available to help you develop the best formulations to meet the most demanding applications. King Industries offers a wide variety of additives that can be used to meet common or unique application requirements.

We have a wide range of testing capabilities including ASTM methods and practices, DIN test methods, military specification tests, industry standard tests and other unique test methods. The combination of high performance additives, extensive testing capability and our ongoing communication with customers results in superior formulations that help you reach your performance goals.

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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