

# Technical Report

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## NA-LUBE<sup>®</sup> BL-1400

### Ashless Multifunctional Antiwear Hydraulic Fluid Package Performance in Group II Base Oils

**NA-LUBE BL-1400** is used to formulate antiwear hydraulic fluids according to Parker Hannifin (Denison) HF-0, HF-1, HF-2 (see Note on page 2), ISO 6743/4 (HM, HV), DIN 51524 parts 2 and 3 (HLP, HVLP), AFNOR NF E 48-603 (HM, VM), SS 155434, VDMA 24318, SEB 181 222 and U.S. Steel 127 and 136.

The table below demonstrates the performance of **NA-LUBE BL-1400** in a Group II Base Oil.

Tests	0.45% NA-LUBE BL-1400	0.60% NA-LUBE BL-1400	Most Severe Requirements
Base Oil	Group II ISO VG 46	Group II ISO VG 46	
<b>Steel Corrosion</b> (ASTM D 665, DIN 51 585) A&B	Pass / Pass	Pass / Pass	<b>DIN 51524 / SEB 181 222</b> Pass
<b>Copper Corrosion</b> (ASTM D 130, DIN 51 759) 3 hours, 100°C 3 hours, 125°C 24 hours, 100°C	1a 1a 1a	1a 1a 1a	<b>DIN 51524:</b> 2 max - <b>SEB 181 222:</b> 1 max
<b>Demulsibility</b> (ASTM D 1401, DIN 51 599) Oil-Water-Emulsion (ml) Time (minutes)	41-39-0 10	40-40-0 10	<b>SEB 181 222</b>  40-37-3 min 20 max
<b>RPVOT (ASTM D 2272)</b> (150°C, H <sub>2</sub> O, O <sub>2</sub> , Fe and Cu catalysts) Lifetime (minutes)	583	680	<b>US Steel</b>  120 min
<b>TOST (ASTM D 943)</b> (95°C, H <sub>2</sub> O, O <sub>2</sub> , Fe and Cu catalysts) Hours to TAN 2 mg KOH/g	5376	6482	<b>DIN 51524</b>  1000 min
<b>Cincinnati Milacron (ASTM D 2020)</b> (168 hours, 135°C) Viscosity Change (%) Acid Number, 168 hours (mg KOH/g) Color, 168 hours Copper Rod Appearance Copper Weight Loss (mg) Iron Rod Appearance Iron Weight Loss (mg) Sludge (mg/100ml)	<5 0.09 3.2 3 -0.4 1 -0.8 2.9	<5 0.12 2.9 2 -0.5 1 -0.9 3.1	<b>P-70</b>  5 max report report 5 max -10 max no color -1.0 to + 3.5 25 max
<b>Air Release (DIN 51589-1)</b> 50°C (minutes)	3	3	<b>DIN 51524</b> 10 max (ISO VG 46)
<b>Foaming (ASTM D 892)</b> Sequence I 25°C (ml/ml) Sequence II 95°C (ml/ml) Sequence III 25°C (ml/ml)	0 / 0 0 / 0 0 / 0	0 / 0 0 / 0 0 / 0	<b>SEB 181 222</b> 100 / 0 50 / 0 100 / 0

(see reverse side)

# NA-LUBE<sup>®</sup> BL-1400

## Ashless Multifunctional Antiwear Hydraulic Fluid Package Performance in Group II Base Oils

(continued)

Tests	0.45% NA-LUBE BL-1400	0.6% NA-LUBE BL-1400	Most Severe Requirements
Base Oil	Group II ISO VG 46	Group II ISO VG 46	
<b>Hydrolytic Stability (ASTM D 2619)</b> Copper Loss (mg/cm <sup>2</sup> ) Acidity of Water Layer (mg KOH/25 g) TAN in Oil, 0 hours / 48 hours (mg KOH/g) Insoluble Content (%) Appearance of Copper Strip (According to ASTM D 130)	0 1.49 0.03 / 0.09 None 1b	0 2.26 0.07 / 0.26 None 1b	<b>Parker Hannifin (Denison) HF-0</b> 0.2 max 4 max
<b>Four Ball Test (DIN 51350-3)</b> 1500 rpm / 1 hour / 300 N (mm) 1800 rpm / 1 hour / 400 N (mm)	0.40 0.48	0.35 0.44	- -
<b>FZG Gear Test A 8.3 / 90 (DIN 51354-2)</b> Damage-Load Stage	12	>12	<b>DIN 51524:</b> 60 max <b>SEB 181 222:</b> 15 max
<b>Denison Filterability</b> Pore Size: 1.2 µm Aging: 2% H <sub>2</sub> O / 5 min, 21°C Filtration Time (1 x 100ml) Procedure A Dry (seconds) Procedure B with Water (seconds)	215 378	183 292	<b>Parker Hannifin (Denison) TP 02100</b>  600 max 2x A max

The results shown reflect data generated by King Industries' Technical Service Laboratory. Actual results may vary depending on the additive package, base oil, and test equipment design.

Note: ISO VG 32, 46 and 68 hydraulic fluids formulated with **NA-LUBE BL-1400** at 0.6% have been approved in both Group I and Group II base stocks by Parker Hannifin (Denison) for HF-0, HF-1 and HF-2 requirements. A Technical Report for performance in a Group I base oil is also available.

For Samples or Technical Service, contact King Industries or your King representative.

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