

FUNCTIONAL GA-400

HX-1 Hydraulic and Gear Package for Incidental Food Contact Lubricants

APPLICATION:

FUNCTIONAL GA-400 is an additive package for H1 hydraulic fluids, light duty gear oils, chain oils, and more. **FUNCTIONAL GA-400** contains antiwear, extreme pressure, antioxidant, friction modifier, and corrosion inhibitors optimized for PAO base oils and provides no change in color to the finished lubricant.

FUNCTIONAL GA-400 is recommended at 0.55wt% and may be used at up to 1.1wt% for NSF H1 lubricants.

COMPOSITION:

FUNCTIONAL GA-400 is an ashless HX-1 additive package containing sulfur/phosphorus/nitrogen chemistry. **FUNCTIONAL GA-400** does not contain hazardous HX-1 aryl dithiophosphate esters like TPPT.

| Typical Properties | |
|----------------------------|----------------|
| Appearance | Clear Liquid |
| Color, ASTM D1500 | < 2.5 |
| Odor | Mild |
| Specific Gravity @ 60°F | 0.98 – 1.02 |
| Lbs per Gallon | 8.3 -8.5 |
| Flash Point, COC, ASTM D92 | 160°C/320°F |
| Viscosity, ASTM D445 | 150 cSt @ 40°C |

| Typical Composition | |
|-----------------------------------|-----------|
| Sulfur (wt%) | 13.9% |
| Phosphorus (wt%) | 0.55% |
| Total Base Number (D4739) | 15 |
| Biobased Content (wt%) | 9% |
| OECD 301B Biodegradation (%) | 15%, Est. |
| Ashless (no Zn, Ca, Na, Si, etc.) | Yes |

TREATMENT LEVEL:

FUNCTIONAL GA-400 is recommended at 0.55 – 1.1wt% depending on level of performance.

HX-1 defoamer and demulsifier are not included. The correct type and wt% of defoamer and demulsifier must be added based on the specific base oil blend and viscosity grade. **FUNCTIONAL DF-400** HX-1 defoamer is recommended at 0.05 – 0.2wt%.

| Performance in ISO 320 mPAO65/PAO4 Blend | | |
|--|----------|-----------|
| | 0.55wt% | 1.1wt% |
| 4-Ball EP Weld Load, ASTM D2783 | 160 kgf | 200 kgf |
| Load Wear Index, ASTM D2783 | 33.0 | 40.0 |
| Falex EP Load, ASTM D3233A | 760 lbs. | 1020 lbs. |
| 4-Ball Wear, ASTM D4172 – 20 kg | 0.48 mm | 0.31 mm |
| RPVOT, ASTM D2722 | 1700 | 1200 |
| Turbine Oil Rust, ASTM D665A – distilled water | Pass | Pass |
| Copper Strip Corrosion, ASTM D130 – 3 and 24 hours @ 100°C | 1b | 1b |

HANDLING:

Store indoors at 20-40°C (68-104°F). Use normal safe procedures for handling and blending. In its concentrated form, **FUNCTIONAL GA-400** may cause skin and eye irritation and should be handled with suitable personal protection. See the Safety Data Sheet.

At treat in suitable H1 base oils, **FUNCTIONAL GA-400** presents no hazards.

This Technical Data Sheet and the Safety Data Sheet contain information believed to be accurate and reliable. No warranty is made, however, to information beyond the control of FUNCTIONAL PRODUCTS INC. The engineering and management personnel of the user are responsible for determining the suitability of this or any product for any specific application, and this information is offered to them for that purpose.

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FORMULATION GUIDE:

FUNCTIONAL GA-400 is optimized for low solvency PAO base fluids. Starting formulations with various PAO at the recommended minimum treat of package are below:

| H1 EP Gear Oils – 160 kgf EP weld load | | | | |
|--|---------|---------|---------|---------|
| Formula by wt% | ISO 220 | ISO 320 | ISO 460 | ISO 680 |
| mPAO 65 | 68.3% | 85% | 84.1% | -- |
| PAO 4 | 31.15% | 14.45% | 15.35% | -- |
| FUNCTIONAL GA-400 | 0.55% | 0.55% | 0.55% | -- |
| PAO 100 | 63.35% | 71.8% | 81.15% | 90.3% |
| PAO 6 | 38.1% | 27.65% | 18.3% | 9.15% |
| FUNCTIONAL GA-400 | 0.55% | 0.55% | 0.55% | 0.55% |

Additional additives are available to improve on the benefits of **FUNCTIONAL GA-400**:

| Benefit | Change to Formula |
|---------------------------------|---|
| Foam reduction | Add 0.05 – 0.2wt% FUNCTIONAL DF-400 defoamer |
| Mist reduction | Add 0.1wt% FUNCTIONAL V-422* tackifier |
| Tacky (open gear) | Add 0.5wt% FUNCTIONAL V-422* tackifier ~10 string length by ductless siphon |
| Very tacky (high speed gear) | Add 1.0wt% FUNCTIONAL V-422 * tackifier ~30 string length by ductless siphon |
| Improved load wear index | Add 1.0wt% Ceramax HX-1 solid lubricant powder to greatly reduce wear scars at loads below the weld point |

**Or any V-400 series tackifier listed as NSF HX-1: V-425 shear stable OCP tackifier, V-475 ultrahigh MW PIB tackifier, etc.*

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