

# FUNCTIONAL PRODUCTS INC.

Innovative Chemistry for Lubricants

## Technical Data Sheet

### FUNCTIONAL GA-307

Zinc-Free Industrial and Automotive Gear Oil Package

#### APPLICATION:

**FUNCTIONAL GA-307** is an EP gear oil package for both industrial and automotive gear oils formulated in conventional and/or synthetic base stocks. **FUNCTIONAL GA-307** utilizes milder, non-corrosive chemistry which can perform at US Steel 224 and API GL-5 levels but remains safer for applications where yellow metals are used (API GL-4 automotive).

#### COMPOSITION:

**FUNCTIONAL GA-307** is a blend of antiwear, EP, inhibitors, antioxidant, and surface active agents in oil.

Typical Properties	
Appearance	Red to Brown Liquid
Color (ASTM D1500)	≤ 5.0
Odor	Sulfur
Lbs. per Gallon	8.3
Flash Point (ASTM D92)	149°C / 300°F
Kinematic Viscosity (ASTM D445)	35 cSt @ 40°C, 5.4 cSt @ 40°C

#### TREATMENT LEVEL:

Treat rate depends on base oil type, viscosity grade, and the severity of the application. 3 or 6wt% is typical.

Application	Weld Load (D2783)	Base Oil	Typical wt%
• R&O Oil	N/A	Any	1wt%
• US Steel 224 and AGMA 9005 industrial gear • API GL-4 automotive	250 kg	Gr. I/II Gr. III PAO	3wt% 4wt% 6wt%
• EP industrial fluids (air tool) • API GL-5 automotive (SAE XW-90, XW-140)	315 kg	Gr. I/II Gr. III PAO	5wt% 6wt% 7wt%
• Heavy duty EP industrial fluids (rock drill) • Racing automotive gear	400 kg	Gr. I/II Gr. III	6wt% 8wt%
• Extreme duty EP industrial fluids (mining)	500 kg	Gr. I/II	12wt%

Check final formulation for demulsibility and foam. Different base stocks may require top treats.

#### HANDLING:

Store in a cool, dry area. See current Safety Data Sheet before use.

**FUNCTIONAL GA-307** is hazard-free after dilution at recommended treat rates in base oil.

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:

To improve demulsibility, 0.1wt% **FUNCTIONAL DM-240** or EO-PO demulsifier is preferred.

To improve anti-foam, 0.1wt% of **FUNCTIONAL DF-110** or silicone defoamer is preferred.

### Conventional Oils (Group I/II, bright stock, naphthenic):

- **FUNCTIONAL GA-307** is compatible in blends of Group I/II/III, naphthenic, and bright stocks.
- Conventional formulas may require extra demulsifier.

#### FUNCTIONAL GA-307 in Conventional ISO 220 EP Industrial Gear Oil

Typical Performance in ISO 220 EP Industrial Gear	
EP Weld Load, D2783	400 kg
Load Wear Index, D2783	66
FZG Failure Stage, D5182	13
Timken OK Load, D2782	>60 lbs
US Steel Wear (1hr, 54°C, 1800 rpm, 20 kg)	0.3 mm
Demulsibility, D1401 (82°C)	40/40/0 (10)
Demuls., D2711B – %water, mL free water, mL emuls.	1%/84/0
Foam I,II,III D892	0/0,10/0,0/0
Copper Strip Corrosion, D130 (3hrs, 100°C)	1a
Turbine Oil Rust, D665A (24hrs, distilled water)	Pass
Turbine Oil Rust, D665B (24hrs, syn. seawater)	Pass

Formula by wt%	Wt%
<b>600 Solvent Neutral</b>	43.9
<b>150 Bright Stock</b>	50.0
<b>FUNCTIONAL GA-307</b>	6.0
<b>FUNCTIONAL DM-240</b>	0.1

### Synthetic Oils (Group III/IV with mPAO, polyolefin, etc.):

- **FUNCTIONAL GA-307** may require 10wt% synthetic ester for solubility. Adipates like DTDA preferred.
- Synthetic formulas may require extra defoamer.

#### FUNCTIONAL GA-307 in Group III 75W-90 GL-5 Automotive Gear Oil

Typical Performance in 75W-90 GL-5	
EP Weld Load, D2783	315 kg
Load Wear Index, D2783	58
Timken OK Load, D2782	> 60 lbs.
4-Ball Wear, D4172 (1hr, 75°C, 1200 rpm, 15kg)	0.175 mm
Demulsibility, D1401 (82°C)	40/40/0 (15)
Foam I,II,III D892	0/0, 10/0, 0/0
Copper Strip Corrosion, D130 (3hrs, 100°C)	1b
Turbine Oil Rust, D665A (24hrs, distilled water)	Pass
Turbine Oil Rust, D665B (24hrs, syn. seawater)	Pass

Formula by wt%	Wt%
4 cSt Group III	84.4
<b>Synthetic Thickener</b>	9.0
<b>FUNCTIONAL GA-307</b>	6.0
<b>FUNCTIONAL PD-630</b>	0.5
<b>FUNCTIONAL DF-110</b>	0.1

Excellent copper strip corrosion resistance in the above GL-5. GL-5 limit is  $\leq 3$  after 3 hours at 121°C.

ASTM D130 @ 100°C	ASTM D130 @ 121°C
3hr = 1b, 24hr = 1b, 48hr = 1b	3hr = 1b, 24hr = 3a, 48hr = 3b

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