



# TECHNICAL DATA

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## 567M VGP-EAL MARINE ECOSHIELD™ BIODEGRADABLE EP GEAR OIL ISO 150, 220, 320

VGP-EAL Marine EcoShield™ Biodegradable EP Gear Oil is a readily biodegradable, environmentally friendly, ecologically responsive, synthetic, non-toxic, thermally stable and thermally durable extreme pressure lubricant that is specially formulated for the lubrication of marine gear drives and thrusters, slide and way systems, bearings and bushings that are subjected to heavy and/or shock loading conditions. VGP-EAL Marine EcoShield™ Biodegradable EP Gear Oil is also recommended for use in bearing and gear applications that are operated in environmentally sensitive areas. VGP-EAL Marine EcoShield™ Biodegradable EP Gear Oil meets the USDA definition EO 13101 and complies with the U.S. EPA's definition of an Environmentally Acceptable Lubricant as defined in Appendix A of the U.S. EPA 2013 Vessel General Permit.

VGP-EAL Marine EcoShield™ Biodegradable EP Gear Oil is formulated from a blend of renewable hydrocarbons, hydrolytically stable, renewable, synthetic esters, and a high performance, multi-functional extreme pressure additive package to provide the following performance advantages and benefits:

- **ENVIRONMENTALLY ACCEPTABLE**
  - Readily biodegradable, with low ecotoxicity
  - Low aquatic toxicity and not bio-accumulative
  - Very low impact to water and soil during usage in case of a spill
  - High renewability content
  - Compatibility with mineral oils, PAO and ester synthetic base fluids
- **EXCELLENT STABILITY**
  - Wide operating temperature range and low volatility characteristics
  - Excellent demulsibility characteristics and hydrolytic stability
  - A high viscosity index with excellent shear stability
  - Excellent extreme pressure retention, thermal and oxidative stability, durability
  - Excellent clean gear performance under high temperature/oxidation conditions
- **WEAR PROTECTION**
  - Excellent lubricity
  - Very good scuffing load capacity
  - Excellent protection from micro pitting fatigue wear especially to heavily loaded gear drives with surface-hardened tooth metallurgies even under extreme conditions
  - Excellent resistance to rust and corrosion
- **DEPOSIT CONTROL**
  - Enhanced gear, bearing and seal cleanliness
  - Excellent prevention against the formation of sludge, carbon and varnish deposits that can erode seals and cause premature bearing and gear wear
  - Excellent filterability for outstanding filter life, even in the presence of water

**Meets and exceeds the following specifications and manufacturers' requirements:**

ZF TE-ML 04M approval number ZF004920 (ISO 150 only)	David Brown S1.53.101
AGMA 9005 E02	DIN 51517 Part 3
AGMA F-16	FZG Micro pitting
AIST 224 (Formally U.S. Steel 224)	ISO 12925-1 CKC/CKD
Cincinnati Machine	

## APPLICATION NOTES

VGP-EAL Marine EcoShield™ Biodegradable EP Gear Oil is miscible with conventional mineral oils, polyalphaolefin synthetic base oils, vegetable base oil (HETG), synthetic ester (HTEES) and synthetic hydrocarbon (HEPR) biodegradable base fluids. ***It is not compatible or miscible with polyalkylene glycol base fluids.*** If the product is mixed with mineral or PAO synthetic base fluids the product may no longer be readily biodegradable. It is recommended that the gear drive and oil circulation system be carefully cleaned and flushed before switching to the VGP-EAL Marine EcoShield™ Biodegradable EP Gear Oil by using the following procedure:

1. Run the equipment until it is warm. Drain the previous lubricant from the gear drive.
2. Replace oil filters
3. Fill the gear drive with VGP-EAL Marine EcoShield™ Biodegradable EP Gear Oil. Run the equipment for 1 to 4 hours under no load conditions in order to completely circulate the fluid
4. Thoroughly drain the VGP-EAL Marine EcoShield™ Biodegradable EP Gear Oil while warm.
5. Change and replace the oil filters.
6. Fill the gear drive with VGP-EAL Marine EcoShield™ Biodegradable EP Gear Oil and begin normal operation.
7. Inspect and change filters as required

VGP-EAL Marine EcoShield™ Biodegradable EP Gear Oil is compatible with hydrogenated nitrile (HNBR), FPM/FKM and Viton® fluoroelastomers. Depending upon the elastomer grade, the product is also compatible with nitrile (NBR, Buna-N) elastomers. Always check with the OEM to verify if the seal material used is compatible and acceptable for use with fluids that contain synthetic esters. Also, prior to application, Schaeffer Mfg. recommends reviewing compatibility and other influencing factors (e.g. maximum permissible water content in the oil) with the component under conditions that would be encountered in the field.

## TYPICAL PROPERTIES

ISO Grade	150	220	320
Specific Gravity 60°F (15.6°C)	.8953	.9132	.9256
Viscosity cSt @ 40°C (ASTM D445)	158.65	229.2	316.52
Viscosity cSt @ 100°C (ASTM D445)	20.43	26.24	33.85
Viscosity Index (ASTM D2270)	150	147	150
Flash Point °F (°C), C.O.C (ASTM D92)	428° (220°)	428° (224°)	442° (228°)
Pour Point °F (°C), (ASTM D97)	-40° (-40°)	-30° (-34°)	-30° (-34°)
Rust Test, 24 hours @ 60°C (ASTM D665) A & B	Pass	Pass	Pass
Copper Strip Corrosion 3 hours @ 100°C (ASTM D130)	1b	1b	1b
FAG FE-8 Bearing Test DIN 51819-3 Roller Wear mg	2	2	2
FZG (Four Square Gear Test) (ASTM D5182;A/8.3/90)	13 <sup>th</sup>	13 <sup>th</sup>	13 <sup>th</sup>
FZG FVA 54/7 Micro-pitting Test	>10/high	>10/high	>10/high
Four Ball EP Test (ASTM D2783) Weld Point, kgf	400	400	400
Four Ball Wear Test (ASTM D4172), 40kg, 1 hour 167°F Scar diameter, mm	0.3	0.28	0.28
Timken OK Load, (ASTM D2782) Failure Load, lbs	70	70	70
Water Separation @ 82°C (ASTM D1401) @ 30 minutes	≤3 ml emulsion	≤3 ml emulsion	≤3 ml emulsion
% Biodegradability OCED 301B	>60%	>60%	>60%
% Bio based Content	>70%	>70%	>70%
Rainbow Trout, 96 hrs. LC50 mg/l	>100	>100	>100
Daphnia Magna, 48 hours LC50 mg/l	>1000	>1000	>1000
Algae, 72 hours, EC50	>1000	>1000	>1000
EPA Static Sheen Test	Pass	Pass	Pass
Bioaccumulation	Negative	Negative	Negative