946 mL – 1 U.S. Quart

bp

TURBO OIL 25

TURBINE ENGINE & ACCESSORY

Introduction

While the changing of our label for turbo oil is relatively new, our experience in lubricating turbine engines is not. In 1949 the Research Division, which was initially responsible for the development of our turbo oils, helped turn the vision of gas turbine powered flight into the reality we accept for granted today. By developing the first synthetic oil that could be used successfully in gas turbine engines, much wider fields to the aircraft designer were opened. This position of leadership has never been relinquished and you can depend on us just as you did in 1949.

BPTO 25

BP Turbo Oil (BPTO) 25 is designed to meet the severe requirements of supersonic aircraft engines and offers exceptional load-carrying ability over Type II oils in subsonic engines, gear boxes and transmissions.

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Product Description

BPTO 25 is a 5 centistoke high load carrying synthetic oil which was developed to meet the severe requirements of supersonic aircraft engines. In order to satisfy supersonic requirements, BPTO 25 incorporates high oxidation resistance to minimize formation of carbon, coke and sludge under high temperature conditions. It also provides high load carrying ability to satisfy the requirements of highly loaded gears and bearings operating in a very demanding environment. BPTO 25 meets DEF STAN 91-100/1 (re-places British Military Specification DERD 2497 Issue 3) and was approved against DERD 2497 on the first and all subsequent issues of the Approved Products List.

The high gear load carrying ability of BPTO 25 earned its approval against U.S. military specification, DOD-L-85734(AS), for helicopter transmission systems. The in-service experience of BPTO 25, in this application, has been most satisfactory.

Details of laboratory analyses of physical, chemical and performance properties are provided in the Appendix. Significant performance properties are discussed below. Where detailed information on the laboratory test methods and the significance of results is desired, a member of the Exxon technical staff will be happy to provide them.

VAPOR PHASE DEPOSITS: An advantage of BPTO 25 is its ability to limit vapor-phase deposits. With some competitive oils, heavy deposits have formed where the oil mist and vapors come in contact with hot engine surfaces resulting in migrating deposits.

LOAD CARRYING: BPTO 25 provides load carrying ability, as measured in the Ryder and IAE Gear Tests, well in excess of requirements established by the engine and equipment manufacturers and is the industry leader in this area. Minimal wear of bearings, gears and other highly loaded lubricated surfaces is thus assured under normal operating conditions.

CLEANLINESS: In order to satisfy supersonic requirements, BPTO 25 incorporates high oxidation resistance to minimize formation of carbon, coke and sludge under extremely high engine operating temperature conditions.

BULK STABILITY (resistance to physical or chemical change resulting from oxidation): The high degree of oxidation resistance of BPTO 25 permits long periods of severe operation without significant increase in viscosity or total acidity, the two principal indicators of product oxidation. The need to change oil because of oxidation effects is rare when using BPTO 25. Most users find it unnecessary to make oil changes in spite of occasional mechanical abnormalities that create unusually severe oxidizing conditions.

SEAL WEAR: Proper functioning of carbon seals is essential for engines that use this type of bearing compartment sealing arrangement. Poor seal performance may be caused by lubricant properties that promote (or fail to prevent) wear of the carbon at the carbon-to-steel sealing face or that result in sluggish seal action due to the formation of deposits in the area of the seal carrier or springs. BPTO 25 has provided excellent carbon seal performance in subsonic engine service.

COMPATIBILITY: Considerable laboratory data is available to demonstrate the compatibility of BPTO 25 with engine metals and with other turbo oils meeting the same specifications to the extent that an inadvertent mixing or emergency top-off with another brand will not cause precipitates to form. **However, most engine builders do not recommend indiscriminate mixing of approved oils and we agree with this principle.**

IN SERVICE: BPTO 25 is currently used in commercial Rolls-Royce RB211 and Olympus 593 operation as well as in supersonic military engines—RB199 and RM8. Exceptional load carrying ability, outstanding bulk stability and excellent cleanliness, as evidenced by low deposit levels in vapor phase areas, have made BPTO 25 the leader in high load gas turbine lubrication. BPTO 25 was used as a development oil in Rolls-Royce RB211, RB199 and GEM, Rolls-Royce Turbomeca Adour, Rolls-Royce/ SNECMA Olympus 593 and Flygmotor RM8B and RM12 engines.

SHELF LIFE: The shelf life of BPTO 25 can extend beyond three years when stored in original, unopened containers under acceptable conditions, such as away from extreme heat and moisture. For all package styles, shelf life can be increased significantly beyond those stated above, depending upon storage conditions. Please contact your bp representative if you have any questions about product usability.

Approvals

BPTO 25 is approved for use in the following engines and accessories in military and commercial airline service. The approvals listed below are current as of the time of printing; however, the respective manufacturer's manuals and service bulletins should be consulted.

ENGINES

General Electric Company: BPTO 25 conforms to GE Spec. D50TF1-S3 Class B and is fully approved for use in all CF6 models (Service Bulletin 79-1).

MTU Turbomeca Rolls-Royce: BPTO 25 is approved for the MTR 390 engine.

Pratt & Whitney Aircraft: BPTO 25 is approved under Specification PWA-521-B (Service Bulletin No. 238) for use in JT3C/D, JT4A, JT8D, JT12, PW4000 and is cleared for flight evaluation in JT9D.

Rolls-Royce Limited: BPTO 25 is approved for the RB211-22B, -535, and -524 (R-R letter April 11, 1973), for the GEM 510, 530/531 (R-R approval letter issue 3.1 March 1988) and for the RB199 (R-R letter January 23, 1976).

Rolls-Royce/SNECMA: BPTO 25 is approved for use in Olympus 593 and Nozzle Trim Units (R-R letter May 17, 1976).

Rolls-Royce Turbomeca: BPTO 25 is approved for Adour (R-R Mechanical Development Report Adour MDR 37346) and the RTM 322.

Turbomeca: BPTO 25 is approved for use in the Makila engine (Makila Maintenance Manual Section 71-00-02).

Volvo Flygmotor: BPTO 25 is approved for the supersonic RM8A, RM8B and RM12 engines and related ancillary equipment.

ACCESSORIES

Aerospatiale: BPTO 25 is approved for the following transmissions in the Aerospatiale Super Puma—332c and 332L: B.T.P., B.T.I. and B.T.A (appropriate pages of Aircraft Flight Manual).

AlliedSignal:

Auxiliary power units: BPTO 25 is approved for field evaluation for all models (AiResearch Engineering Report GT-7800H dated August 10, 1977).

Turbo compressors: BPTO 25 is approved for most models which currently accept the TYPE II oils (AiResearch letter FSAS-2128-0825 dated August 25, 1972).

Hamilton Standard: BPTO 25 is approved for flight evaluation (subject to customer request) in APU Model UAC ST6.

Lucas Aerospace Ltd.: BPTO 25 is approved for the AE8909 integrated drive generator in Concorde (Lucas Engineering Report GS 0302 dated January 27, 1975).

Sundstrand: BPTO 25 is approved for all CSD and IDG models (appropriate Sundstrand Maintenance Manuals).

Westinghouse Aerospace Div.: BPTO 25 is acceptable for service evaluation in DC-10 generators (Westinghouse Telex No. 810-447-2712 dated January 16, 1975).

Technical Service

BP provides technical service in support of its products and their performance. The two vital elements of this service consist of a highly qualified Technical Staff and a complex of Sales Service Laboratories. As the name implies, the Technical Staff maintains contact with customers, engine and airframe manufacturers, and accessory equipment manufacturers. The Sales Service Laboratories provide laboratory services to assist in used oil analyses.

TECHNICAL STAFF

The Technical Staff consists of aviation career specialists to provide service to customers and to work with major airframe and engine builders. These specialists have at their disposal the full facilities of Sales Service Laboratories and BP product research facilities. This system ensures that each individual is well informed on equipment developments, industry problems and product performance. Thus, while only one member of the Technical Staff will be the principal contact with a customer, that member will reflect the experience and knowledge of the entire organization and will have ready access to all facilities of the corporation for assistance as required on behalf of his assigned accounts. The fact that the Technical Staff is part of the headquarters of their respective organizations assures that the staff members have headquarters' authority to assist in effective handling of their assignments.

BP provides worldwide technical service in support of turbo oil customers. Service is coordinated by Air BP Lubricants from its office in Parsippany, New Jersey.

SALES SERVICE LABORATORIES

The Sales Service Laboratories are located throughout the world at BP's major refineries and blending plants. These laboratories in turn are backed up by the full facilities of BP research facilities in Naperville, Illinois.

PRODUCT SAMPLE PROCEDURES AND HANDLING

The base purpose of analyzing product samples is to assist in solving or defining a problem that may be related to the performance of the lubricant. Thus, the sample size and handling procedures may vary with the nature of the suspected problem and with the analytical techniques required for definition and solution. Experience has provided standardized procedures applicable in many instances. Details are available from a member of the Technical Staff.

Quality Control

BPTO 25 is blended in batches with each batch composed of the identical chemicals, in the same proportions, used in all previous batches. Extensive testing is performed on each batch to evaluate the physical, chemical and performance characteristics of the product. Historically, the batch-to-batch variations are within the limits of test repeatability.

As each batch is prepared, a quantity of product is set aside in sealed containers. Periodically, a container is opened and tested to ensure that no change has occurred in the physical or chemical properties as a result of time. Customers can enhance the product storage stability life by using first-in, first-out inventory procedures and maintaining the oil under normal storage conditions (indoors protected from excessive heat). Within these parameters, experience has shown BPTO 25 shelf life has no effect on its performance. It is suggested that oil that has been exposed to extremes of high temperature and humidity in storage be retested.

Most important in monitoring product quality is the frequent observation of airline engines and accessories. A specialized rating system has been developed by the Technical Staff in cooperation with the product research facilities. This system provides for numerical descriptions of engine mechanical condition and lubricant performance for all critical lubricated components. By this means, the conditions of two or more engines can be compared even though they may be inspected at different times. The system thus provides a yardstick for measuring the uniformity of performance in operating engines. This method of documentation also permits an appraisal of engine mechanical condition, an evaluation of the effectiveness of mechanical modifications and a comparison of the performance of different lubricants.

Health and Safety Precautions

Health studies have shown that under normal conditions of use, turbo oil presents a low risk to human health. The major health risk from exposure to turbo oil is temporary irritation of the eyes, skin, and respiratory tract. Temporary irritation is a common hazard of most petroleum hydrocarbons and synthetic lubricants, like turbo oil. Irritation occurs when product is applied directly to the eyes, repeatedly to the skin, or when high levels of vapors or mist are inhaled. Because sensitivity to irritation can vary from person to person, direct contact with the eyes and skin, and inhalation of vapors or mist should be minimized. Prolonged and repeated skin contact with turbo oil can also cause temporary dermatitis.

Because the vapor pressure of turbo oil is very low, generation of vapor under ambient temperature conditions is unlikely. At elevated temperatures, however, product vapor may be generated at concentration levels sufficient to cause irritation, particularly in poorly ventilated areas or in confined spaces. If this occurs, or if a mist of turbo oil is generated, precautions should be taken to avoid inhaling vapor or mist at concentrations above the exposure guidelines specified on the product Material Safety Data Sheet (MSDS). Prolonged over-exposure to vapors or mist could cause headache, light-headedness, dizziness, and potentially unconsciousness, but normal conditions of use will not produce these effects.

You can protect yourself from routine turbo oil-related hazards by using appropriate engineering controls and work practices, and by wearing proper eye protection, gloves and clothing. Additional important health and safety information for this product is provided on the MSDS, which is available from your BP representative. The exposure guidelines found on the MSDS should always be followed.

Turbo oil should never be siphoned by mouth. However, if the oil is swallowed, DO NOT induce vomiting, but seek medical advice immediately to guard against the hazard of aspirating oil into the lungs. While the oil is not highly toxic when swallowed, lung aspiration can result in chemical pneumonia that may not occur for some time.

In the event of fire or leakage of product onto an extremely hot surface which causes turbo oil to burn, emission of fumes and combustion products that are potentially irritating, noxious, and toxic may occur, such as aldehydes and carbon monoxide. Take precautions to avoid and/or minimize exposure under these conditions. Use supplied oxygen if necessary.

Additional health and safety information may be obtained by writing to: Air BP Lubricants, Air BP, Maple Plaza II-1N, Six Campus Drive, Parsippany, NJ 07054.

Appendix

BPTO 25 Typical Inspections vs. DEFSTAN 91-100/2 Specification (DERD 2497)

The values shown here are representative of current production. Some are controlled by manufacturing specifications, while others are not. All of them may vary within modest ranges.

SPECIFICATION TESTS	BPTO 25	DERD 2497	TEST METHOD ASTM	IP	DERD*
Bearing test no. 1 Rolls Royce rig	Stage 1, 15 hrs. @ 300°C Stage 2, 15 hrs. @ 300°C	Report			No. 1
Confined heat stability					No. 2
(1) S3-192 temperature of formation of 0.5% wt. toluene insolubles after 192 hrs.	300°C	Report			
(2) Viscosity stability Viscosity decrease, %	0.8	5 max			
Corrosivity					
(1) Cadmium (140°C/2 hrs.)	Pass	Report			No. 3
(2) Other materials (200°C/192 hrs.) mg/cm^2, weight change					No. 4
	New / Pre-treated	New oil / Pre-treated oil (5 hrs./325°C)			
Aluminum alloy	−0.1 / Nil	−0.1 to +0.1 / −0.1 to +0.1			
Copper	−1.0 / −1.0	−1.0 to +0.1 / −1.5 to +0.1			
Titanium copper alloy	−0.1 / Nil	−0.2 to +0.1 / −0.1 to +0.1			
Copper-nickel-silicon alloy	−0.2 / −0.8	−0.5 to +0.1 / −1.5 to +0.1			
Mild steel	−0.1 / −10.6	Report / Report			
Lead bronze	−0.2 / −0.6	−0.5 to +0.1 / −1.5 to +0.1			
High carbon chromium steel	−0.1 / −1.1	−0.2 to +0.1 / −3.0 to +0.1			
Leaded brass	−0.8 / −0.9	−1.5 to +0.1 / −4.0 to +0.1			
Ni Cr case hardened steel	−0.1 / −0.5	−0.2 to +0.1 / −3.0 to +0.1			
High speed steel	−0.1 / +0.1	−0.2 to +0.1 / −1.0 to +0.1			
Copper (catalyst only)	(−0.9) / —	— / —			
Nickel	+0.1 / —	−0.1 to +0.1 / —			
Silver	+0.1 / —	−0.2 to +0.1 / —			
Magnesium alloy	−4.9 / —	Report / —			
Chromated Mg alloy	+0.4 / —	Report / —			
Chromated Mg alloy, phenolic resin coated	−6.4 / —	Report / —			
Elastomer compatibility, 192 hrs.					
Nitrile (@ 130°C) - 1/2 hour, swell %	20.5	15 - 25			No. 7
48 hour swell %	21.6	18.5 - 30.5			
bend test	Pass	No cracking			
Viton (@ 200°C) - 1/2 hour, swell %	24	20 - 35			No. 6
48 hour swell %	26	22 - 34			
bend test	Pass	No cracking			
Silicone (@ 100°C) - 1/2 hour, swell %	−0.7	No shrinkage			No. 5
48 hour swell %	−2.5	No shrinkage			
bend test	—	Not required			
permanent indentation, mm x 10^{-2} max	0	25			
Engine test	Pass	Must pass	Engine & accessories determined by the Ministry of Technology		

** The test method is identified by its number listed in the DERD 2497 specification supplement.*

Appendix

BPTO 25 Typical Inspections vs. DEFSTAN 91-100/2 Specification (DERD 2497) (Cont'd)

SPECIFICATION TESTS	BPTO 25	DERD 2497	TEST METHOD ASTM	IP	DERD*
Homogeneity, –54°C to 210°C	Meets	No visible signs of separation, gelation, or formation of insoluble matter			No. 8
Hydrolytic stability					
Time to TAN of 1.5 mg KOH/g, hours @ 90°C	140	30 min			No. 9
Time to TAN of 1.5 mg KOH/g, hours @ 70°C	820	420 min			
Load carrying ability					
(1) IAE gear machine				166**	
Percentage of reference (EATO 35) @ 110°C					
Gear speed 2000 r.p.m.	Passes (>185%)	100% min			
6000 r.p.m.	260%	100% min			
(2) OL 593 bevel gear test	Passes	No scuffing, scoring or unduly heavy marking			No. 10
Oil mist coking	Satisfactory	Report			No. 16
Oxidative stability—high temperature					No. 12
(1) Toluene insolubles 192 hrs. @ 210°C, % weight increase	Less than 0.05	0.05 max			
(2) Viscosity increase 192 hrs. @ 185°C, %	Less than 15	15 max			
(3) Acidity increase 192 hrs. @ 185°C	Less than 1.0	1.0 mg KOH/g max			
(4) Z25 and Z192 temperatures	Passes	Must pass			
Temperature where residue becomes solid					
@ 25 hrs.	255°C	Report			
@192 hrs.	225°C	Report			
Percentage solid residue					
Z25	37%	Report			
Z192	38%	Report			
Oxidative stability—low temperature	Passes	No insoluble deposits			No. 13
Sonic shear stability, 52°C	Passes	No sludge or gummy water			No. 14
Specific gravity 104/60°F	0.977	Report	D70	190	
Specific heat 100°F (38°C)	0.445	Report	D2766		
500°F (260°C)	0.575	Report			
Temperature index of bearing cleanliness ($^2/_3$B + $^1/_3$S) index, C°	250	235 min			No. 12 & 2
Trace element content, PPM					
Al	< 0.1	2 max			
Fe	< 0.1	2 max			
Cr	< 0.1	5 max			
Ag	< 0.1	2 max			
Cu	< 0.1	2 max			
Mg	< 0.1	2 max			
Ni	0	5 max			
Ti	0	2 max			
Pb	< 0.1	Report			
Si	< 0.1	Report			

** The test method is identified by its number listed in the DERD 2497 specification supplement.*

*** Modified*

Appendix

BPTO 25 Typical Inspections vs. DEFSTAN 91-100/2 Specification (DERD 2497)

SPECIFICATION TESTS	BPTO 25	DERD 2497	TEST METHOD ASTM	IP	DERD*
Viscosity, high temp., cSt	1.35	1.3 min @ 400°F min	D445**	71**	
Viscosity, low temp. stability 72 hrs. @ –40°C	Meets	±6% max	D2532		
Volatility loss, 192 hours @ 185°C	7.5%	15% max			No. 12
General inspection tests					
Appearance	Passes	Clear, no water or sediment			
Autogenous ignition temp. °F (°C)	815 (435)	734 (390) min	D2155		
Flash point, P.M. °F (°C)	465 (241)	410 (210) min	D93	34	
Foaming tendency (after 15 mins)			D892	146	
aeration/1 min settling					
Foaming sequence I	Trace/0	25 max/0 max			
Foaming sequence II	5/0	25/0			
Foaming sequence III	Trace/0	25/0			
Pour point, °F (°C)	<–75 (–59)	–65 (–54) max	D97	15	
Saponification value	405	Report	D94**	136**	
Sediment, % wt.	<.005	.005 max			No. 12
Specific gravity 60/60°F	0.9952	Report	D1298	160	
Total acid number, mg KOH/g	0.38	Report	D664	177	
Viscosity at 210°F (99°C), cSt	5.16	5.5 max	D445	71	
Viscosity at 100°F (38°C), cSt	28.2	25.0 min	D445	71	
Viscosity at –40°F (–40°C), cSt	8990	13,000 max	D445	71	

** The test method is identified by its number listed in the DERD 2497 specification supplement.*

*** Modified*

Appendix

BPTO 25 Typical Inspections vs. DOD-L-85734(AS) Specification

The values shown here are representative of current production. Some are controlled by manufacturing specifications, while others are not. All of them may vary within modest ranges.

SPECIFICATION TESTS	BPTO 25	DOD-L-85734(AS) MIN.	DOD-L-85734(AS) MAX.	ASTM STANDARD	FED. TEST METHOD STD. NO. 791
Viscosity, cSt @ –40°C	8990	—	13,000	D2532*	
% change –40°C, 72 hrs.	0.6	—	±6	D2532*	
cSt @ 98.9°C	5.16	5.00	5.50	D445	
cSt @ 37.8°C	27.2	25.0	—	D445	
Flash point, °C	255	246	—	D92	
Pour point, °C	–60	—	–54	D97	
TAN, mgKOH/g	0.38	—	0.50	D664*	
Evaporation loss, %, 6.5 hrs. @ 204°C	1.8	—	10	D972*	
Foam 1 24°C, ml/collapse time	5/0.05	—	25/1	D892*	
2 93.5°C, ml/collapse time	5/0.03	—	25/1		
3 24°C, ml/collapse time	5/0.08	—	25/1		
Rubber compatibility					
H Rubber, % Swell, 72 hr. @ 70°C	14	5	25		
F Rubber, % Swell, 72 hr. @ 204°C	14	5	25		
Si Rubber, % Swell, 96 hr. @ 110°C	–3	0	25	Appendix of 85734 Spec.	
Tensile strength loss, %	57.6	—	60		
Compatibility	Pass	Pass		Part 4.5.1 of 85734 Spec.	
Turbidity	Pass	None			
Sediment, mg/l	2	—	10		
Ryder gear					6508
Av. rel. rating, % reference oil	167	154	—		
No. of determinations	2	—	—		
Ref. oil, av. rating, lbs./in.	2400	—	—		
Bearing test, 100 hrs.					3410
Overall deposit rating	20	—	80		
Filter deposits, mg	0.44	—	3.0		
Oil consumption, ml	1680	—	2,000		
Vis change @ 38°C, %	+16.4	—	35		
TAN change, mg KOH/g	1.0	—	2.0		
Shear stability				D2603	
Vis loss @ 38°C, %	0.5	—	4		
Storage stability 6 wks. @ –18°C	Pass	Pass		Part 4.5.2 of 85734 Spec.	
Thermal stability and corrosivity, 274°C					3411
% Vis change	–0.5	—	5.0		
TAN change, mg KOH/g	5.8	—	6.0		
Metal wt. change, mg/cm^2	–0.7	—	4.0		
Sediment 1.2 micron, mg/l	2.1	—	10		3010*
Visual undisolved water	Pass	None			
Ash, mg/l	0	—	1.0		

** Modified*

Appendix

BPTO 25 Typical Inspections vs. DOD-L-85734(AS) Specification (Cont'd)

SPECIFICATION TESTS	BPTO 25	DOD-L-85734(AS) MIN.	DOD-L-85734(AS) MAX.	ASTM STANDARD	FED. TEST METHOD STD. NO. 791
Oxidation and corrosion stability, 72 hrs. @ 175°C				Part 4.5.4 of 85734 Spec.	
Fe, mg/cm²	0	—	± 0.2		
Ag, mg/cm²	−0.07	—	± 0.2		
Al, mg/cm²	0	—	± 0.2		
Mg, mg/cm²	+0.08	—	± 0.2		
Cu, mg/cm²	+0.05	—	± 0.4		
Vis, change @ 38°C, %	+10.3	—	−5 to +15		
TAN change, mgKOH/g	+0.56	—	2.0		
Sludge, mg/100ml	0.1	Report			
Oxidation and corrosion stability, 72 hrs. @ 204°C				Part 4.5.4 of 85734 Spec.	
Fe, mg/cm²	0	—	± 0.2		
Ag, mg/cm²	−0.04	—	± 0.2		
Al, mg/cm²	0	—	± 0.2		
Mg, mg/cm²	+0.02	—	± 0.2		
Cu, mg/cm²	−0.04	—	± 0.4		
Vis, change @ 38°C, %	+19.9	—	0 to +30		
TAN change, mgKOH/g	+0.77	—	± 3.0		
Sludge, mg/100ml	1.1	—	50		
Oxidation and corrosion stability, 72 hrs. @ 218°C				Part 4.5.4 of 85734 Spec.	
Fe, mg/cm²	0	—	± 0.2		
Ag, mg/cm²	−0.06	—	± 0.2		
Al, mg/cm²	−0.02	—	± 0.2		
Ti, mg/cm²	−0.01	—	± 0.2		
Vis, change @ 100°F, %	+54.3	Report			
TAN change, mgKOH/g	+6.68	Report			
Sludge, mg/100ml	0.9	Report			
Trace metal content, ppm				Part 4.5.5 of 85734 Spec.	
Al	0	—	2		
Fe	1	—	2		
Cr	0	—	2		
Ag	0	—	1		
Cu	0	—	1		
Sn	8	—	11		
Mg	0	—	2		
Ni	0	—	2		
Ti	1	—	2		
Si	2	—	10		
Pb	0	Report			
Mo	2	Report			

** Modified*

Appendix

BPTO 25 Typical Inspections vs. DOD-L-85734(AS) Specification (Cont'd)

OTHER TESTS	BPTO 25	DOD-L-85734(AS) MIN.	DOD-L-85734(AS) MAX.	ASTM STANDARD	FED. TEST METHOD STD. NO. 791
Viscosity, cSt @ 40°C	25.2	—	—	D445	
Viscosity, cSt @ 100°C	5.06	—	—	D445	
SOD Lead Corrosion, mg/cm^2	0	—	—		5321
Specific Gravity, 60/60°F	0.995	—	—	D972	
Coefficient of Expansion (Avg: –40°F to 300°F)	0.00045	—	—	BP Method	
Specific Heat BTU/lb/°F				D2766	
@ 100°F	0.444	—	—		
@ 200°F	0.493	—	—		
@ 300°F	0.533	—	—		
@ 400°F	0.565	—	—		
Thermal Conductivity, BTU/(hr.)(ft.^{2})(°F/ft.)				D2717	
@ 100°F	0.085	—	—		
@ 400°F	0.075	—	—		

** Modified*

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MADE IN THE U.S.A.

25BRO-04/02